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James W. Davis





CHESAPEAKE AND OHIO CANAL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

ESTIMATES OF THE COST OF MAKING A CANAL]

FROM

CUMBERLAND TO GEORGETOWN.

MARCH 10, 1828.

Read, and laid on the table.

WASHINGTON :

PRINTED BY GALES & SEATON.

1828.

DEPARTMENT OF WAR,

March 10th, 1828.

SIR: I have the honor to transmit, herewith, a report of the Civil Engineers, appointed to make an estimate of the cost of the proposed Chesapeake and Ohio Canal, in obedience to a resolution of the House of Representatives, of the 26th ultimo.

I have the honor to be,

Sir, very respectfully,

Your obedient servant,

JAMES BARBOUR.

Hon. ANDREW STEVENSON,

Speaker of the House of Representatives.



ENGINEER DEPARTMENT,

Washington City, March 10, 1828.

SIR : In compliance with your directions, I have the honor to present, herewith, the Report of the Civil Engineers, appointed to make an estimate of the cost of the proposed Chesapeake and Ohio Canal, which was called for by a resolution of the House of Representatives, of the 26th ultimo.

I have the honor to be,

Very respectfully,

Your obedient servant,

A. MACOMB,

Maj. Gen. Ch. Engineer.

Hon. JAMES BARBOUR,

Secr'y of War.

To Maj. Gen. ALEXANDER MACOMB, *Chief Engineer :*

The undersigned beg leave to report : That, in pursuance of an appointment to view the route and revise the estimates of the Chesapeake and Ohio Canal, a careful and particular location and survey has been made of the eastern section thereof, commencing one mile below Cumberland, and terminating at the tide water at the city line of Georgetown. Maps and profiles of the same, are herewith presented. Of the estimated expense, three different calculations have been made.

First. For a canal and locks of the dimensions of the State canals of New York, Pennsylvania, and Ohio; having, at hand, accurate calculations of their various structures, and tables of the different depths of excavation and embankment, slope, &c. Those canals are forty feet at the water surface, four feet depth of water, and twenty-eight feet wide at bottom. The locks are ninety feet in the chamber, and fifteen feet in width.

Second. For a canal of the dimensions required by the Board of Engineers, viz : forty-eight feet at the water line, with surf berms two feet horizontally on each side, five feet depth of water, and thirty-three feet in width at the bottom. Locks one hundred and two feet in the chamber, and fourteen feet in width ; and

Third. For a canal, as recommended by the Committee on Roads and Canals, "that, wherever practicable by common excavation, the said canal shall have its surface enlarged to sixty feet, with a proportionate breadth at the bottom," which is computed at forty-five feet, and five feet depth of water. The dimensions of the locks

the same as recommended by the Board of Engineers, viz: one hundred and two feet in length, and fourteen feet in width. Those portions of the proposed canal which have been widened to forty-eight and sixty feet, amount to one hundred and twenty-six miles, and two hundred and ninety-nine yards; and which may be considered as the most feasible kind of earth for excavation, &c., being mostly on old alluvial bottom, free from roots and stones, and along moderate slopes from six to twelve degrees of declivity.

These parts of the canal, which, from motives of safety and economy, are not enlarged over forty feet at surface, amount to sixty miles and one thousand and fifty-four yards, and include all the deep embankments, steep side-hill cutting, and embankments in the river—on basements of stone, from fifteen to thirty feet wide, and from two to eight feet deep, or to the surface of the water, are calculated, where necessary; and protected on the outside by a strong paving of stone, of the average thickness of two feet from the basement to the top of the embankment, with a slope of one and a half base, to one perpendicular. These two portions make the whole length of the eastern section, one hundred and eighty-six miles, and one thousand three hundred and fifty-three yards. Each sub-division of which, has been divided into miles and shorter distances, and carefully estimated, together with the necessary culverts, aqueducts, bridges, locks, waste weirs, dams, and feeders; all which are included in the following calculations. The result is given at the end of each sub-division, and the grand result at the conclusion.

SUBDIVISION No. 1.

First Mile.

	Distance. Yds.		Dolls. Cts.
Slate excavation	-	19,714 cubic yards at 25 cents,	4,928 50
Ditto	-	17,500 do at 15 cents,	2,625 00
Common embankment	-	60 do at 12½ cts.,	1,350 00
Common excavation	-	533 do at 10 cents,	1,599 00
Ditto	-	492 do at 9 cents,	575 64
	<hr/>		
1 Culvert	1,760		
2 Bridges	-	-	300 00
Grubbing	-	-	300 00
	-	-	400 00
			<hr/>
			\$ 12,078 14

Second Mile, passing Mr. Thistle's.

Common embankment	-	20,250 cubic yards at 12½ cts.,	2,531 25
do excavation	-	24,030 do at 9 cents,	2,162 70
do	-	1,044 do at 8 cents,	1,085 76
	<hr/>		
1 Culvert	1,760		
1 Bridge	-	-	300 00
Grubbing	-	-	150 00
	-	-	200 00
			<hr/>
			\$ 6,429 71

SUBDIVISION No. 1--Continued.

Third Mile 4-503 yards, crossing Evit's creek.

	Distance, yds.		Dolls. cts.
Common embankment	-	87	32,604 cubic yards at 14 cents, -
do do	-	657	do at 18 cents, -
do and slate excavation, (pine ridge)	-	608	do at 25 cents, -
Common excavation	-	711	do at 9 cents, -
			1,279 80
Culvert 20 feet span, Evit's creek	-	yds. 2,063	2,730 00
do 6 feet	-	-	450 00
			<u>\$ 66,131 49</u>

Fourth Mile is only 1457 yds.

Common embankment	-	67	5,762 cubic yards at 11 cents, -	633 82
Excavation	-	1,390	do at 9 cents, -	1,751 40
		1,457		
Grubbing	-	-	-	50 00
1 Farm bridge	-	-	-	150 00
1 Culvert	-	-	-	350 00
Moving road	-	-	-	200 00
				<u>3,135 22</u>

Fifth Mile, passing Copely's.

Embankment	-	-	133	21,325 cubic yards at 12½ cts., -	2,665 62
Excavation	-	-	1,627	do at 9 cents, -	2,542 88
			<hr/>		
			1,760		
Grubbing	-	-	-	-	150 00
1 Farm bridge	-	-	-	-	150 00
3 Culverts	-	-	-	-	1,050 00
					<hr/>
					6,358 50

Sixth Mile, deep cut across a large bend of the river.

Excavation	-	-	460	39,332 cubic yards at 20 cents, -	7,866 40
Common excavation	-	-	1,300	do at 9 cents, -	1,755 00
			<hr/>		
			1,760		
Grubbing	-	-	-	-	400 00
1 Bridge	-	-	-	-	175 00
5 Locks, 40 feet, at \$ 800 per foot lift	-	-	-	-	32,000 00
					<hr/>
					42,196 40

Seventh Mile, opposite Patterson creek.

Embankment in river	-	-	1,133	36,256 cubic yards at 20 cents, -	7,251 20
Paving the same	-	-	-	do at 75 cents, -	4,248 75
Common excavation	-	-	627	do at 10 cents, -	1,093 20
			<hr/>		
			1,760		

SUBDIVISION No. 1—Continued.

Seventh Mile.—Continued.

	Distance, yds.	Dolls. cts.
Grubbing - - -	-	150 00
Moving road - - -	-	1,133 00
3 Locks, 24 feet, at \$ 800 per foot lift -	-	19,200 00
		<u>\$ 32,986 15</u>

Eighth Mile, passing Big Spring.

Embankment - - -	283	5,660 cubic yards at 10 cents, -	566 00
Paving the same - - -	-	1,415 do at 75 cents, -	1,061 25
Embankment - - -	133	5,985 do at 10 cents, -	598 50
Common excavation - - -	1,344	17,472 do at 8 cents, -	1,397 76
	<u>1,760</u>		
2 Culverts - - -	-	-	700 00
1 Farm bridge - - -	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot lift	-	-	6,400 00
			<u>10,873 51</u>

Ninth Mile.

Embankment in river - - -	210	5,250 cubic yards at 20 cents, -	1,050 00
Paving the same - - -	-	1,050 do at 75 cents, -	787 50
Embankment - - -	16	880 } 23,890 cubic yds. at 8 cts. 1,911 20	
Common excavation - - -	1,534	23,010 }	
	<u>1,760</u>		
2 Culverts - - -	-	-	600 00
			<u>4,348 70</u>

Tenth Mile + 280 yds. Braddock's Mill.

Embankment -	-	-	333	9,324 cubic yards at 12½ cts., -	1,165 50
Paving the same -	-	-	-	do at 90 cents, -	1,198 80
712 yards stone basing in the river -	-	-	-	do at 50 cents, -	11,748 00
Embanking in river, -	-	-	712	do at 18 cents, -	9,483 84
Paving the same -	-	-	-	do at 90 cents, -	4,485 60
Common embankment -	-	-	150	do at 10 cents, -	675 00
do excavation -	-	-	845	do at 8 cents, -	946 40

1 m. 280 yds.

Grubbing -	-	-	-	-	200 00
1 Culvert -	-	-	-	-	350 00
1 Farm bridge -	-	-	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot lift	-	-	-	-	6,400 00

36,803 14

Eleventh Mile, 1,480 yds.

Embankment in river -	-	-	800	2,560 cubic yards at 10 cents, -	2,560 00
Paving the same -	-	-	-	do at 1 dollar, -	4,000 00
Common embankment -	-	-	16	720 } 14,100 do at 8 cents, -	1,128 00
do excavation -	-	-	664	13,380 }	
2 Culverts -	-	-	-	-	600 00
1 Farm bridge -	-	-	-	-	150 00

8,438 00

SUBDIVISION No. 1.—Continued.

Twelfth Mile.

	Distance, yds.		Doll. cts.
Embankment over culvert	- 33	1,485 cubic yards at 10 cents, -	148 50
Common excavation	- 250	7,500 } 26,701 do at 8 cents, -	2,136 08
do	- 1,477	19,201 }	
3 Culverts	- 1,760	- - - - -	1,000 00
<i>Thirteenth Mile, on Strather's bottom.</i>			
Common embankment	- 100	5,000 } 26,580 cubic yards, at 8	
do excavation	- 1,660	21,580 } cents, - - -	2,126 40
3 Culverts	- 1,760	- - - - -	900 00
1 Farm bridge	- - -	- - - - -	150 00
			<u>3,176 40</u>

\$ 3,284 58*Fourteenth Mile, (Alum Hill.)*

Embankment in river, -	- 375	44,334 cubic yards, at 20 cents,	8,866 80
Paving the same, -	- -	3,375 do at \$1, -	3,375 00
Common embankment, over culvert, -	- 100	4,500 do at 10 cents,	450 00
Do. excavation, -	- 1,285	17,990 do at 9 cents,	1,619 10
			<u>1,760</u>

Grubbing, - - - - -	-	-	-	-	100 00
2 culverts, - - - - -	-	-	-	-	700 00
1 bridge, - - - - -	-	-	-	-	156 00
1 lock, 8 feet lift, at \$800 per foot lift, -	-	-	-	-	6,400 00
					<u>21,660 90</u>

Fifteenth Mile, (opposite Old Town.)

Embankment in river, - - - - -	-	-	-	51,300 cubic yards, at 20 cents,	10,260 00
Paving the same, - - - - -	-	-	-	do at \$1, -	10,260 00
Common excavation, - - - - -	-	-	-	do at 8 cents,	939 52
					<u>1,760</u>
1 culvert, (mill race,) - - - - -	-	-	-	-	400 00
1 bridge, - - - - -	-	-	-	-	200 00
					<u>22,059 52</u>

Sixteenth Mile.

Common embankment, - - - - -	-	-	-	27,411 cubic yards, at 12½ cents,	3,426 37
Do. excavation, - - - - -	-	-	-	do at 8 cents,	1,393 38
3 culverts, - - - - -	-	-	-	-	1,500 00
1 farm bridge, - - - - -	-	-	-	-	150 00
1 lock, 8 feet lift, at \$800 per foot lift, -	-	-	-	-	6,400 00
					<u>12,869 75</u>

SUBDIVISION No. 1—Continued.

1,652 yards—remainder of 1st Subdivision.

	Distance, yds.		Dolls. cts.
Embanking in river,	-	450	49,500 cubic yards, at 20 cents,
Paving the same.	-	-	4,050 do at 75 cents,
Common excavation,	-	1,242	17,388 do at 8 cents,
Grubbing,	-	-	-
1 road bridge,	-	-	-
			9,900 00
			3,057 50
			1,391 04
			200 00
			200 00
End near the South Branch of Potomac,			-
			\$ 14,728 54

REMARKS ON FIRST SUBDIVISION.

The feasible parts amount to - - -	8 miles 1,635 yards.
The deep cuttings, embankments, &c. -	8 " 57 "
	<hr/> 16 miles 1,692 yards. <hr/>

The deep cut is across the Great Bend ; timbered land, and the soil favorable. The principal embankment is at Ewit's creek, the earth for which will be obtained from each end, and from the bottom over which it passes, and is of good quality. The river embankments and paving are at the Narrows, Braddock's Hill, Alum Hill, and other places not named. In some places, the earth for embanking is obtained from the adjoining excavation ; in others, it is obtained, with more expense, from the excavations at the ends, or intermediate places. The stone for paving is of good quality at the Narrows, but at Alum Hill and Braddock's Hill it is not so easily quarried, and the price is made accordingly. The same discretion in regulating prices, has been observed through the whole of these estimates. It is proper to observe, that the descriptions of difficulties and facilities, as given by the report of the United States' Engineers, has been found to apply to each subdivision, with usual accuracy.

The lockage on this subdivision is 96 feet, in 12 locks, 64 feet of which is located between the deep cut and the first narrows. They are placed at proper distances from each other, on suitable ground. The other four locks are distributed to suit the ground.

The stone for building locks, and for culverts and other necessary purposes, is very good, and found, generally, convenient to each place where it may be wanted. But good cutting stone, suitable for lock-sills, and hollow quoins, and the face of the locks, not so abundant ; but it is presumed it may be found. The lime, and other materials for the locks, can be obtained from Cumberland, at reasonable prices, ten miles below Cumberland. Lime can be had four and a half miles from the Potomac, at the kilns where it is burnt, at 10 cents a bushel ; delivered for 12½ cents the bushel.

The feeder from Ewit's creek has not been included in the estimates of this subdivision, as the supply of water from the Potomac, taken in at Cumberland, was judged would be amply sufficient to supply the canal to the South Branch, where an additional supply is again received.

Instead of locking into the Potomac at Alum Hill, it was judged best to continue the canal quite down to the feeder at the South Branch, as the expense of constructing a towing-path, and paving it the whole way, would be nearly equal to that of the canal, besides the great inconvenience of a river navigation in time of high water, for such a distance ; and, at low water, the height of the towing path above the boat would be objectionable.

ABSTRACT of the 1st Subdivision.

Distance.	To fence and widen.	Culverts.	Bridges.	Lockage.	COST.
1	-	1	2	-	\$ 12,078 14
2	1,563	1	1	-	6,429 71
3	-	1	-	-	66,151 49
4	933	1	1	-	3,135 22
5	667	3	1	-	3,358 50
6	600	-	1	40	42,196 40
7	-	-	-	24	32,986 15
8	1,267	2	1	8	10,873 51
9	1,534	2	-	-	4,348 70
10	845	1	1	8	36,803 14
11	664	2	1	-	8,438 00
12	1,477	3	-	-	3,284 58
13	1,660	3	1	-	3,176 40
14	1,285	2	1	8	21,660 90
15	734	1	1	-	22,059 52
16	1,234	3	1	8	12,869 75
1692 yds.	1,242	-	1	-	14,728 54
16m. 1692y.	15,715 <small>or 8m. 1635 yds.</small>	26	14	96	\$ 304,558 65
12 miles of fencing, at \$480 per mile,					- - 5,760 00
7 waste wiers, 280 feet, at \$4,					- - 1,120 00
*Dam across the Potomac, below the mouth of the South Branch,					} 9,000 00
Cost of a 40 feet surface CANAL, with four feet of water, and locks 90 feet long,					} \$320,438 65

Of the 1st subdivision, 15,715 yards are on feasible ground, on which a canal of 48 feet at the surface, with surf berms, and five feet depth of water, and locks of 102 feet in the chamber, can be made at the following additional expense, viz :

* The dam across the Potomac is about one-fourth of a mile below the mouth of the South Branch, where a reef of rocks extend quite across the bed of the river, and afford a sure foundation for the dam, (to be raised 12 feet. The waters thus raised, will flow up the river, to Alum hill, and afford a spacious basin on the Virginia side, for that distance.

For widening the canal, 15,715 yards, at \$1 per yd.	\$ 15,715 00
lengthening 22 culverts, at \$55 each, - -	1,210 00
do. 12 bridges, at \$50 " - -	600 00
do. 96 feet of lockage, at \$80 per foot lift,	7,680 00

Amount of addition, - - -	\$ 25,205 00
Added to the cost of a 40 feet canal, - -	320,438 65

Total cost of a canal of 48 feet surface, -	<u>\$ 345,643 65</u>
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Additions to make the above 8 miles and 1,635 yards of canal 60 feet at surface, without surf berms, 5 feet depth of water, and locks 102 feet long, as above, viz :

For widening 15,715 yards of the canal, at \$1 50,	\$ 23,572 50
lengthening 22 culverts, at \$94 each, - -	2,068 00
do 12 bridges, at \$150 each, - -	1,800 00
do 96 feet lockage, at \$80 per foot lift,	7,680 00

	\$ 35,120 50
Add the cost of a canal of 40 feet surface, -	320,438 65

Total cost of a 60 feet canal, - - -	<u>\$ 355,559 15</u>
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SUBDIVISION No. 2.

First Mile.

Feeder from above the dam, across the Potomac, which is to enter the canal below Lock No. 1.

Length of feeder, 800 yards; 37,600 cubic yards of excavation at 12½ cents, - \$ 4,700 00
Guard lock, 10 feet lift, at \$ 800 per foot lift, - - 8,000 00

	Distance, yds.		
Common excavation,	-	24,640 cubic yards, at 8 cts.	- 1,971 20
2 Culverts,	-	-	- 700 00
1 Farm bridge,	-	-	- 150 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	- 6,400 00
			<u>\$ 21,921 20</u>

Second Mile, (crossing Town Creek,)

Embankment,	-	83	17,430 cubic yards, at 12½ cents,	\$ 2,178 75
Common excavation,	-	1,677	do at 8 cents,	2,012 40
Aqueduct, 3 arches, 30 feet span, over Town creek,	-	-	-	9,500 00
Culvert for mill-race,	-	-	-	500 00
2 Bridges,	-	-	-	350 00
				<u>\$ 14,541 15</u>

Third Mile.

Common embankment,	-	33	2,805 cubic yards, at 11 cents,	308 55
River embankment,	-	508	do at 18 cents,	4,572 00
Paving embankment,	-	-	do at 75 cents,	2,095 50

Common excavation,	-	-	1,219	18,285	do	at 8 cents,	1,462 80
1 Culvert,	-	-	-	-	-	-	450 00
Grubbing,	-	-	-	-	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	-	-	-	-	6,400 00
							<hr/>
<i>Fourth Mile.</i>							15,438 85

River embankment,	-	-	1,760	130,240 cubic yards, at 20 cents,	26,048 00
Paving the same,	-	-	-	do at 75 cents,	9,240 00
					<hr/> \$5,288 00

Fifth Mile, (along the foot of Greg's Mountain.)

River embankment,	-	-	1,760	184,800 cubic yards, at 18 cents,	33,264 00
Paving the same,	-	-	-	15,840 do at 90 cents,	14,256 00
3 Culverts,	-	-	-	-	1,000 00
Grubbing,	-	-	-	-	200 00
					<hr/> 48,720 00 <hr/>

Sixth Mile.

River embankment,	-	-	283	11,320 cubic yards, at 16 cents,	1,811 20
Paving the same,	-	-	-	2,547 do at 1 dollar,	2,547 00
Common embankment,	-	-	50	10,000 do at 11 cents,	1,100 00
Common excavation,	-	-	1,327	18,578 do at 8 cents,	1,486 24
1 Culvert,	-	-	-	- - -	400 00
Grubbing,	-	-	-	- - -	50 00
					<hr/> 7,394 44

SUBDIVISION No. 2—Continued.

Seventh Mile, (passes Col. Greenwell's.)

	Distance, yds.		Dolls. cts.
Common embankment,	-	13,120 cubic yards, at 11 cents,	1,443 20
Common excavation,	-	23,506 do at 8 cents,	1,880 48
2 Culverts,	-	-	700 00
2 Bridges,	-	-	300 00
			<u>\$ 4,323 68</u>

Eighth Mile.

River embankment,	-	75,600 cubic yards, at 22 cents,	16,632 00
Paving the same,	-	8,820 do at 75 cents,	6,615 00
Common excavation,	-	8,000 do at 8 cents,	640 00
2 Locks, 16 feet, at \$ 800 per foot,	-	-	12,800 00
Grubbing,	-	-	100 00
			<u>36,787 00</u>

Ninth Mile.

All common excavation,	-	70,400 cubic yards, at 10 cents,	7,040 00
1 Culvert,	-	-	300 00
			<u>7,340 00</u>

Tenth Mile, (Paw Paw Ridge.)

Embankment in river,	-	1,760	105,600 cubic yards, at 20 cents,	21,120 00
Paving the same,	-	-	14,080 do at 1 dollar,	14,080 00
Rocks placed in base of bank to water surface,	-	-	12,000 do at 50 cents,	6,000 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	- - -	6,400 00
				<u>47,600 00</u>

Eleventh Mile.

River embankment,	-	1,760	184,800 cubic yards, at 20 cents,	36,960 00
Paving the same,	-	-	15,840 do at 1 dollar,	15,840 00
Cutting 5 rocky points,	-	-	3,050 do at 50 cents,	1,525 00
				<u>54,325 00</u>

Twelfth Mile.

River embankment,	-	267	16,020 cubic yards, at 18 cents,	2,883 60
Paving the same,	-	-	1,869 do at 1 dollar,	1,869 00
Common excavation,	-	1,493	38,818 do at 9 cents,	3,493 62
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	- - -	6,400 00
				<u>14,646 22</u>

Thirteenth Mile.

River embankment,	-	1,760	142,560 cubic yards, at 25 cents,	35,640 00
Paving the same,	-	-	15,840 do at 1 dollar,	15,840 00
Cutting 4 rocky points,	-	-	400 do at 50 cents,	200 00
				<u>51,680 00</u>

SUBDIVISION No. 2—Continued.

Fourteenth Mile.

	Distance, yds.		Dolls. cts.
River embankment,	-	12,800 cubic yards, at 17 cents,	2,176 00
Paving the same,	-	4,000 do at 75 cents,	3,000 00
Common excavation,	-	20,400 do at 8 cents,	1,632 00
Rock to be cut away,	-	150 do at 50 cents,	75 00
			<u>\$16,883 00</u>

Fifteenth Mile.

River embankment,	-	12,600 cubic yards, at 16 cents,	2,016 00
Paving the same,	-	5,250 do at 75 cents,	3,937 50
Common excavation,	-	19,760 do at 9 cents,	1,778 40
Point of rocks to cut,	-	300 do at 50 cents,	150 00
1 Culvert,	-	-	400 00
1 Farm bridge,	-	-	150 00
Grubbing,	-	-	100 00
			<u>8,531 90</u>

Sixteenth Mile.

Common Embankment,	-	4,974 cubic yards, at 11 cents,	547 14
Common Excavation,	-	25,695 do at 8 cents,	2,055 60
2 Culverts,	-	-	700 00
Grubbing,	-	-	50 00
1 Lock, 8 feet lift, at \$ 800 per foot,	-	-	6,400 00
			<u>9,752 74</u>

Seventeenth Mile.

River embankment,	-	-	1,060	119,780 cubic yards, at 18 cents,	21,560 40
Paving the same,	-	-	-	9,540 do at 75 cents,	7,155 00
Common excavation,	-	-	700	10,500 do at 9 cents,	945 00
Rocky point to cut,	-	-	-	300 do at 50 cents,	150 00
2 Culverts,	-	-	-	- -	600 00
Grubbing,	-	-	-	- -	150 00
					<hr/> 30,560 40 <hr/>

Eighteenth Mile.

River embankment,	-	-	1,092	52,416 cubic yards, at 15 cents,	7,862 40
Paving the same,	-	-	-	7,644 do at 90 cents,	6,809 60
Common excavation,	-	-	668	9,852 do at 8 cents,	748 16
Grubbing,	-	-	-	- -	300 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	-	- -	6,400 00
					<hr/> 21,190 16 <hr/>

Nineteenth Mile. (opposite Mitchell's plantation.)

River embankment,	-	-	892	66,008 cubic yards, at 18 cents,	11,881 44
Paving the same,	-	-	-	8,920 do at 90 cents,-	8,028 00
Common excavation,	-	-	868	13,020 do at 8 cents,	1,041 60
Points of rocks to cut,	-	-	-	1,800 do at 50 cents,	900 00
3 Culverts,	-	-	-	- -	900 00
Grubbing,	-	-	-	- -	200 00
					<hr/> 22,951 04 <hr/>

SUBDIVISION No. 2—Continued.

Twentieth Mile.

	Distance, yds.		Dolls. cts.
Common embankment,	- 80	6,000 cubic yards, at 10 cents,	600 00
Common excavation,	- 1,680	do at 8 cents,	1,881 60
3 Culverts,	- -	- -	1,000 00
Grubbing,	- -	- -	100 00
			<u>\$3,581 00</u>

Twenty-first Mile, (passing Mr. Folck's plantation)

Common excavation,	- 1,760	24,640 cubic yards, at 8 cents,	1,971 20
1 Lock, 8 feet lift, at \$ 800 per foot,	- -	- -	6,400 00
			<u>8,371 20</u>

Twenty-second Mile, (passing Mr. Titball's plantation.)

Common excavation,	- 1,760	24,640 cubic yards, at 8 cents,	1,971 20
1 Road bridge,	- -	- -	200 00
			<u>2,171 20</u>

Twenty-third Mile.

Common Excavation,	- 1,760	24,640 cubic yards, at 8 cents,	1,971 20
1 Culvert,	- -	- -	300 00
Grubbing,	- -	- -	200 00
			<u>2,471 20</u>

Common embankment,	-	134	9,540 cubic yards, at 10 cents,	954 00
Common excavation,	-	1,626	22,764 do at 8 cents,	1,821 12
2 Culverts,	-	-	-	700 00
1 Farm bridge,	-	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	-	6,400 00
				<u>10,025 12</u>

4

Twenty-fifth Mile.

River embankment,	-	867	36,414 cubic yards, at 18 cents,	6,554 52
Paving the same,	-	-	5,202 do at 1 dollar,	5,202 00
Common excavation,	-	893	13,395 do at 10 cents,	1,339 50
Grubbing,	-	-	-	200 00
1 Lock, 8 feet lift, at \$ 800 per foot lift,	-	-	-	6,400 00
				<u>19,696 02</u>

Twenty-sixth Mile, (opposite Washington's bottom.)

River embankment,	-	1,760	105,600 cubic yards, at 18 cents,	19,008 00
Paving the same,	-	-	10,560 do. do. 75 cents,	7,920 00
Cutting rocky points,	-	-	1,545 do. do. 50 cents,	727 50
1 Culvert,	-	-	-	300 00
				<u>\$ 27,955 50</u>

SUBDIVISION No. 2—Continued.

Twenty-seventh Mile.

	Distance, yds.		Dolls. cts.
Common deep excavation,	1,760	42,240 cubic yards, at 9 cents,	3 801 60
Paving a part,	-	2,800 do. do. \$1 00,	2 800 00
3 Culverts,	-	-	1 200 00
1 Farm bridge,	-	-	150 00
			<u>\$7,951 60</u>

Twenty-eighth Mile.

River embankment,	1,760	184,800 cubic yards, at 25 cents,	46,200 00
Paving the same,	-	15,840 do. do. 75 cents,	11,880 00
Cutting two rocky points and placing under embankment,	-	1,640 do. do. 50 cents,	820 00
2 Culverts,	-	-	600 00
Grubbing,	-	-	300 00
			<u>59,800 00</u>

Twenty-ninth Mile.

River embankment,	1,000	22,000 cubic yards, at 18 cents,	3,960 00
Paving the same,	-	10,000 do. do. \$1 00,	10,000 00
Common excavation,	760	11,400 do. do. at 8 cents,	912 00
1 Bridge,	-	-	150 00
			<u>15,022 00</u>

Thirtieth Mile, (crosses Fifteen Mile Creek.)

River embankment above lock,	-	200	20,000 cubic yards at 18 cents,	3,600 00
Paving the same,	-	-	do. \$1 00,	2,400 00
Embanking in river below the lock,	-	400	do. at 18 cents,	4,320 00
Paving the same,	-	-	do. \$1 00,	2,400 00
Common embankment,	-	50	do. at 12½ cents,	1,625 00
do. excavation,	-	1,110	do. 8 cents,	1,776 00
Culvert at 15 Mile creek, (14 feet chord,)	-	-	-	1,200 00
1 ditto, small,	-	-	-	300 00
1 Farm bridge,	-	-	-	150 00
Grubbing,	-	-	-	100 00
1 Lock, 8 feet lift, at \$ 800 per lift foot,	-	-	-	6,400 00
				<hr/>
				23,871 00

Thirty-first Mile.

River embankment,	-	567	69,741 cubic yards, at 25 cents,	17,435 25
Paving the same,	-	-	75 do.	4,252 50
Embankment in river,	-	508	20 do.	7,518 40
Paving the same,	-	-	75 do.	2,667 00
Common excavation,	-	685	9 do.	986 40
Reeks to cut away,	-	-	50 do.	750 00
1 Culvert,	-	-	-	300 00
*Dam and feeder from the Potomac,	-	-	-	10,000 00
				<hr/>
				43,909 55

* See remarks at the end of this subdivision.

SUBDIVISION No. 2—Continued.

Thirty-second Mile, (passing Mr. Engle's farm.)

	Distance, yds.		Dolls. cts.
Common Excavation, -	-	52,800 cubic yards, at 10 cents,	5,280 00
1 Farm bridge, -	1,760	-	150 00
Grubbing, -	-	-	200 00
1 Lock 8 feet lift, at \$ 800 per foot lift, -	-	-	6,400 00
			<u>\$ 12,030 00</u>

Thirty-third Mile.

River embankment, -	1,760	216,480 cubic yards, at 25 cents,	54,120 00
Paving the same, -	-	17,600 do. 75 cents,	13,200 00
Grubbing, -	-	-	300 00
			<u>67,620 00</u>

Thirty-fourth Mile, (crossing Sideling's Hill Creek.)

Embankment in river, -	458	56,334 cubic yards, at 18 cents,	10,140 12
Paving the same, -	-	7,750 do. 80 cents,	6,200 00
Embankment at Sideling's Hill Creek, -	-	20,440 do. 12½ cents,	2,555 00
Common excavation, -	1,229	50,725 do. 9 cents,	2,765 25
Aqueduct, 3 arches 50 feet chord, -	-	-	9,500 00
1 Road bridge, -	-	-	200 00
Grubbing, -	-	-	75 00
			<u>31,435 37</u>

Thirty-fifth Mile.

Common excavation,	-	-	1,760	24,640 cubic yards, at 8 cents,	1,971 20
1 Culvert,	-	-	-	-	350 00
1 Farm bridge,	-	-	-	-	150 00
					<u>2,471 20</u>

Thirty-sixth Mile, (limestone abounds.)

Common embankment,	-	-	67	7,435 cubic yards, at 12½ cents,	929 37
Common excavation,	-	-	1,693	25,395 do.	2,031 60
4 Culverts,	-	-	-	-	1,500 00
1 Farm bridge,	-	-	-	-	150 00
1 Lock 8 feet lift, at \$ 800 per foot lift,	-	-	-	-	6,400 00
					<u>11,010 97</u>

533 Yards, remainder of second sub-division.

Common excavation,	-	-	533	8,528 cubic yards at 8 cents,	682 24
1 Culvert,	-	-	-	-	300 00
Grubbing,	-	-	-	-	100 00
					<u>1,082 24</u>

End opposite the mouth of Great Cacapon.

REMARKS ON SUBDIVISION SECOND.

The feasible parts of this sub-division are,	-	23 miles 193 yards.
Embankments and other difficult ground,	-	13 do 340 do
Length of second sub-division,	- - -	56 do 533 do
Lockage in fourteen locks,	- - -	- - 112 feet.
At the feeder, one guard lock,	- - -	- - 10 do

At the commencement of this sub-division a navigable feeder is calculated from the great basin in the Potomac at the South Branch, from which a copious supply of water can be drawn, which is to be regulated by means of a guard lock, of the same dimensions of those on the canal.

On the thirty-first mile of the second subdivision a dam across the Potomac and a feeder to the canal is calculated to enter below the twelfth lock. This dam will form the second spacious basin for the accommodation of the Virginia side, connected with the canal by the short navigable feeder and the guard lock.

It is believed that a quantity of water may be drawn into the canal from the Potomac, at this point, sufficient to supply the lockage and evaporation, soakage, &c., to the Great Conecheague, without taking Licking creek : for which reason it has not been included in these calculations—neither has the feeder from the Great Cacapon.

An Abstract of the Estimates of the Second Sub-division.

Distance.	To fence & widen. Yards.	Culverts.	Bridges.	Lockage. Feet.	Cost.
1	1,760	2	1	8	\$ 21,921 21
2	1,760	1	2	-	14,541 15
3	900	1	-	8	15,438 85
4	-	-	-	-	35,288 00
5	-	3	-	-	48,720 00
6	1,160	1	-	-	7,394 44
7	1,760	2	2	-	4,323 68
8	800	-	-	16	36,787 00
9	1,760	1	-	-	7,340 00
10	-	-	-	8	47,600 00
11	-	-	-	-	54,525 00
12	1,760	-	-	8	14,646 22
13	-	-	-	-	51,680 00
14	1,760	-	-	-	6,833 00
15	80	1	1	-	8,531 90
16	1,760	2	-	8	9,752 74
17	500	2	-	-	30,560 40
18	400	-	-	8	22,190 16
19	1,400	3	-	-	22,951 04
20	1,760	3	-	-	3,581 60
21	1,760	-	-	8	8,371 20
22	1,760	-	1	-	2,171 20
23	1,760	1	-	-	2,471 20
24	1,760	2	1	8	10,025 12
25	1,100	-	-	8	19,696 02
26	-	1	-	-	27,955 50
27	1,200	3	1	-	7,951 60
28	700	2	-	-	59,800 00
29	1,760	-	1	-	15,022 00
30	1,760	2	1	8	23,871 00
31	500	1	-	-	43,909 55
32	1,760	-	1	8	12,030 00
33	-	-	-	-	67,620 00
34	1,760	-	1	-	31,435 37
35	1,760	1	1	-	2,471 20
36	1,760	4	1	8	11,010 97
533 yds.	533	1	-	-	1,082 24
<hr/>					
Igth 36m. 533 yd	41,673	40	15	112	\$811,350 56
Allow for eighteen waste weirs at \$ 200 each,					3,600 00
Fencing 41,673 yds. or 23 ms. and 193 yds. at \$480 per m.					11,365 36
<hr/>					
Total cost of 36 ms. 533 yds. of a canal of 40 ft. surface, \$826,315 92					

Of the second sub-division, 23 miles 193 yards are on feasible ground, on which a canal of 48 feet surface, &c. can be made, at the following additional expense, viz :

For widening the canal 41,673 yards, at \$ 1 per yard,	\$ 41.673 00
lengthening 40 culverts, at \$ 55 each,	- - 2,200 00
do 15 bridges, at \$ 50 each,	- - 750 00
do 112 feet of lockage, at \$ 80,	- - 8,960 00
To be added to the cost of a 40 feet canal,	- 826,315 92

Total cost of a canal of 48 feet surface, &c. \$ 879.898 92

Additions to make the above 23 miles and 193 yards of canal 60 feet at surface and 5 feet depth of water, and locks 102 feet long, &c.

For widening 41,673 yards of canal, at \$ 1 50,	\$ 62,509 50
lengthening 40 culverts, at \$ 94 each,	- - 3 760 00
do 15 bridges, at \$ 150 each,	- - 2,250 00
do 112 feet of lockage, at \$ 80 a foot lift,	8,960 00

\$ 77.479 50

To be added to the cost of a 40 feet canal, - 826 315 92

Total cost of a canal of 60 feet surface, \$ 903 795 42

SUBDIVISION No. 3.—From Great Capon to Licking Creek.

First mile.

	Distance, yds.		Dolls. cts.
River embankment,	-	22,723 cubic yards at 17 cents,	3,862 91
Paving the same,	-	8,063 do at 80 cents,	6,450 40
Common excavation,	-	1,027 do at 8 cents,	1,150 24
Rocky points to cut away,	-	500 do at 50 cents,	250 00
1 farm bridge,	-	-	150 00
Grubbing,	-	-	150 00
			<u>12,013 55</u>

Second mile.

River embankment,	-	18,760 cubic yards, at 18 cents,	3,376 80
Paving the same,	-	3,484 do at 80 cents,	2,787 20
Common embankment,	-	8,800 } 10,615 do at 12½ cents,	1,326 87
Do do.	-	1,815 }	
Do excavation,	-	19,306 do at 8 cents,	1,544 48
Points of rocks to cut,	-	1,000 do at 50 cents,	500 00
2 culverts,	-	-	600 00
1 farm bridge, \$ 150—Grubbing, \$ 100,	-	-	250 00
			<u>10,385 35</u>

Third mile, (passing Leopard's mills.)

Common embankment,	-	3,145 cubic yards, at 12½ cents,	393 12½
Do excavation,	-	25,890 do at 8 cents,	2,071 20
2 culverts,	-	-	600 00
2 road bridges,	-	-	400 00
			<u>3,464 32</u>

SUBDIVISION No. 3.—Continued.

Fourth mile.

	Distance, yds.		Dolls. cts.
River embankment,	-	62,309 cubic yards, at 25 cents,	15,597 50
Paving the same,	-	do at 1 dollar,	4,771 00
Common embankment,	-	do at 12½ cents,	687 50
Do excavation	-	do at 8 cents,	1,504 16
1 culvert	-	-	400 00
1 farm bridge	-	-	150 00
Lock No. 1, 8 feet lift, at \$ 800 per foot lift,	-	-	6,400 00
			<u>\$ 29,510 16</u>

Fifth mile, (Harvey's and Summers' plantations.)

River embankment,	-	61,380 cubic yards, at 25 cents,	15,345 00
Paving the same,	-	do at 1 dollar,	4,433 00
Common excavation,	-	do at 8 cents,	1,602 80
2 culverts,	-	-	600 00
1 farm bridge,	-	-	150 00
			<u>22,130 80</u>

Sixth mile, (by Lime Kilns, abundance of limestone.)

Embankment in river,	-	48,000 cubic yards, at 25 cents,	12,000 00
Paving the same,	-	do at 90 cents,	6,480 00
Common excavation,	-	do at 8 cents,	1,152 00
Lock No. 2, 8 feet lift, at \$ 800 per foot lift,	-	-	6,400 00
			<u>26,032 00</u>

Seventh mile, (by Catfish Rock.)

River embankment	-	79,662 cubic yards, at 25 cents,	19,915 50
Paving the same,	-	do at 90 cents,	5,049 00

Cutting points of rocks,	-			do	at 50 cents,	250 00
Rocky excavation,	-	300	9,000	do	at 50 cents,	4,500 00
Common excavation,	-	899	14,384	do	at 9 cents,	1,294 56
1 culvert,	-	-	-	-	-	400 00
<i>Eighth mile.</i>						\$1,409 06
Common excavation,	-	1,760	24,640 cubic yards,	at 8 cents,	1,971 20	
1 culvert,	-	-	-	-	-	350 00
1 farm bridge,	-	-	-	-	-	150 00
<i>Ninth mile, (by the Little Conoloroway creek.)</i>						2,471 20
Embankment at Conoloroway creek,	-	130	23,400 cubic yards,	at 14 cents,	3,276 00	
Do over culvert,	-	100	8,200 do	at 11 cents,	902 00	
Common excavation,	-	1,530	21,420 do	at 8 cents,	1,713 60	
1 culvert, 15 feet chord, Little Conoloroway,	-	-	-	-	-	1,500 00
3 do 4 feet	-	-	-	-	-	1,000 00
1 farm bridge,	-	-	-	-	-	150 00
<i>Tenth mile, (passing Hancock.)</i>						8,541 60
Common embankment,	-	50	6,500 cubic yards,	at 12½ cents,	812 50	
Common excavation	-	1,710	23,940 do	at 8 cents,	1,915 20	
1 culvert,	-	-	-	-	-	500 00
2 road bridges,	-	-	-	-	-	400 00
						3,427 70

SUBDIVISION No. 3.—Continued.

Eleventh mile, (passing Hancock and Great Conoloway creek.)

	Distance, yds.		Dolls. cts.
Deep cutting,	-	21,188 cubic yards, at 16 cents,	3,390 08
Embankment,	-	38,160 do at 12½ cents,	4,770 00
Do	-	2,310 do at 11 cents,	254 10
Common excavation,	-	20,775 do at 8 cents,	1,662 00
Aqueduct over Great Conoloway creek,	-	-	10,000 00
1 culvert,	-	-	300 00
1 farm bridge,	-	-	150 00
Lock No. 3, 8 feet lift, at \$800 per foot lift,	-	-	6,400 00
			<hr/> \$ 26,926 18 <hr/>

Twelfth mile.

Common embankment,	-	200	17,500 cubic yards, at 12½ cents,	2,187 50
Do excavation,	-	1,560	23,400 do at 8 cents,	1,872 00
2 culverts,	-	-	-	700 00
1 farm bridge,	-	-	-	150 00
				<hr/> 4,909 50 <hr/>

Thirteenth mile, (parallel to turnpike road and Mrs. Bevan's place.)

Common embankment,	-	42	3,820 cubic yards, at 12½ cents,	477 50
River embankment,	-	233	6,990 do at 25 cents,	1,747 50
Paving the same,	-	-	2,097 do at 1 dollar,	2,097 00
Common excavation,	-	1,485	22,275 do at 8 cents,	1,782 00
2 culverts,	-	-	-	700 00

1 farm bridge,	-	-	-	-	-	-	-	150 00
Lock No. 4, 8 feet lift, at \$ 800 per foot lift,	-	-	-	-	-	-	-	6,400 00
								<u>13,554 00</u>

Fourteenth mile.

River embankment,	-	-	-	167	5,010 cubic yards, at 20 cents,	1,002 00
Paving the same,	-	-	-	-	1,503 do at 90 cents,	1,352 70
Common embankment,	-	-	-	33	4,620 do at 12½ cents,	577 50
Do excavation,	-	-	-	1,560	21,840 do at 8 cents,	1,747 20
2 culverts,	-	-	-	-	-	700 00
1 farm bridge,	-	-	-	-	-	150 00
						<u>5,529 40</u>

Fifteenth mile, (passing Doctor Jacques.)

River embankment,	-	-	-	617	92,550 cubic yards, at 18 cents,	15,659 00
Paving the same,	-	-	-	-	6,787 do at 75 cents,	5,090 25
Common embankment,	-	-	-	17	1,190 do at 12½ cents,	148 75
Do excavation,	-	-	-	1,126	22,520 do at 9 cents,	2,026 80
2 culverts,	-	-	-	-	-	600 00
1 farm bridge,	-	-	-	-	-	150 00
						<u>24,674 80</u>

Sixteenth mile, (near turnpike road.)

Common embankment,	-	-	-	1,760	88,400 cubic yards, at 15 cents,	13,200 00
1 culvert,	-	-	-	-	-	300 00
1 farm bridge,	-	-	-	-	-	150 00
						<u>13,650 00</u>

SUBDIVISION No. 3.—Continued.

Seventeenth mile, (passing Mr. Snyder's plantation.)

	Distance, yds.		Dolls. cts.
Common excavation,	-	26,400 cubic yards, at 8 cents,	2,112 00
1 culvert,	-	-	300 00
2 farm bridges,	-	-	300 00
455 yards, remainder of third sub-division.			<u>\$ 2,712 00</u>
Common embankment,	-	5,950 cubic yards, at 14 cents,	833 00
Common excavation,	-	5,775 do at 8 cents,	462 00
1 culvert,	-	-	300 00
End at Licking creek.			<u><u>1,595 00</u></u>

AN ABSTRACT of the estimates of the 3d Sub-division.

Distance.	To fence & widen. yds.	Culverts.	Bridges.	Lockage. feet	Cost.
1	1,027	-	1	-	\$ 12,013 55
2	1,379	2	1	-	10,385 35
3	1,726	2	2	-	3,464 32
4	1,343	1	1	8	29,510 16
5	1,419	2	1	-	22,130 80
6	960	-	-	8	26,032 00
7	899	1	-	-	31,409 06
8	1,760	1	1	-	2,471 20
9	1,760	3	1	-	8,541 60
10	1,760	1	2	-	3,427 70
11	1,760	1	1	8	26,926 18
12	1,760	2	1	-	4,909 50
13	1,485	2	1	8	13,354 00
14	1,593	2	1	-	5,529 40
15	1,143	2	1	-	24,674 80
16	1,760	1	1	-	13,650 00
17	1,760	1	2	-	2,712 00
455 yds.	455	1	-	-	1,595 00
17m. 455 y.	25,749 yds. or 14 ms. 1,199 yds.	25	18	32	\$ 242,736 62

For 5 wast weirs, at \$ 200 each, - - 1,000 00
Do. 14 miles 1,109 yards of fencing, at \$ 480 per m. 7,022 45

Total cost of a canal of 40 feet surface, - \$ 250,759 07

Of the 3d sub-division, 14 miles and 1,109 yards are on feasible ground, where a canal of 48 feet surface, with surf berms and locks 102 feet long, &c. can be made at the following additional expense, viz :

For widening the canal 25,749 yards at \$ 1 \$ 25,749 00
Do. lengthening culverts, 25 at \$ 55 each, 1,375 00
Do. do. bridges, 18 at \$ 50 each, 900 00
Do. lockage 32 feet, at \$ 80 each, 2,560 00

30,584 00
Add cost of a canal of 40 feet surface, 250,759 07

Total cost of canal of 48 feet surface, \$ 281,343 07

To make the feasible parts of the 3d sub-division 60 feet at surface, &c. the following are the additions :

For widening the canal 14 miles 1,109 yards, or	
25,749 yards, at \$ 150	\$ 38,623 50
Do. lengthening 25 culverts, at \$ 94 each,	2,350 00
Do. do. 18 bridges, at \$ 150	2,700 00
Do. do. 32 feet lockage, at \$ 80	2,560 00
To which add the cost of the 40 feet canal,	250,759 07

Total cost of a 60 feet canal,	<u>\$ 296,992 57</u>
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SUBDIVISION, No. 4.

*From Licking creek to Conococheague, at Williamsport.**First mile.*

	Distance, yds.	Dolls. cts.
Aqueduct over Licking creek, (3 arches 80 feet)	-	\$ 10,000 00
Common excavation,	1,760	2,252 80
2 Farm bridges,	-	300 00
Grubbing,	-	150 00
		<u>\$ 12,702 80</u>

Second mile.

Common excavation,	1,760	\$ 3,260 80
2 Culverts,	-	600 00
1 Bridge,	-	150 00
Grubbing,	-	150 00
		<u>4,160 80</u>

Third mile.

Common excavation,	1,760	\$ 4,224 00
1 Culvert,	-	300 00
1 Bridge,	-	150 00
Grubbing,	-	200 00
		<u>4874 00</u>

Fourth mile, (passes Fort Frederick.)

Common excavation,	1,760	4,928 00
2 Culverts,	-	600 00
2 Bridges,	-	300 00
		<u>5,828 00</u>

SUBDIVISION No. 4.—Continued.

Fifth mile, (Limestone abounds.)

	Distance, yds.		Dolls. cts.
Common excavation,	-	44,000 cubic yards, at 8 cents,	3,520 00
2 Culverts,	-	-	600 00
1 Bridge,	-	-	150 00

\$ 4,270 00

Sixth mile, (passing Garrison falls and North mountain.)

Common excavation,	-	1,760	60,960 cubic yards, at 8 cents,	4,876 80
1 Culvert,	-	-	-	400 00
2 Farm bridges,	-	-	-	300 00

5,576 80

Seventh mile, (passing M'Coy's ferry and North mountain.)

Common embankment,	-	183	31,335 cubic yards, at 12½ cents,	3,916 87
Rocky ground,	-	20	do. 60 cents,	132 00
Do do.	-	440	do. 16 cents,	2,252 80
Common excavation,	-	1,117	do. 10 cents,	3,574 40
3 Culverts, (1 of 10 feet for Greenspring run)	-	-	-	1,500 00
3 Bridges, (2 farm and 1 road.)	-	-	-	500 00

11,876 07

Eighth mile, (passing Prater's Neck.)

Deep-cut excavation	-	778	89,872 cubic yards, at 40 cents,	35,948 80
Common do.	-	982	do. 16 cents,	7,856 00
2 Bridges,	-	-	-	350 00

1 Culvert,	-	-	-	-	-	300 00
4 Locks, 32 feet, at \$ 800 per foot lift,	-	-	-	-	-	25,600 00
<i>Ninth mile, (Limestone cliffs, and Charles' mills.)</i>						70,054 80

River embankment,	-	-	800	126,400 cubic yards, at 35 cents,	44,240 00
Paving the same,	-	-	-	8,000 do.	75 cents, 6,000 00
River embankment,	-	-	483	16,905 do.	20 cents, 3,381 00
Paving the same,	-	-	-	3,381 do.	75 cents, 2,535 75
Common excavation,	-	-	477	19,080 do.	12½ cents, 2,385 00
2 Culverts, (near Charles' mills.)	-	-	-	-	1,000 00
1 Lock, 8 feet lift, at \$ 800 per foot,	-	-	-	-	6,400 00
<i>Tenth mile.</i>					<u>65,941 75</u>

River embankment,	-	-	967	15,472 cubic yards at 35 cents,	54,152 00
Paving the same,	-	-	-	10,637 do.	75 cents, 7,977 75
Common excavation,	-	-	793	50,752 do.	12½ cents, 6,344 00
1 Culvert,	-	-	-	-	300 00
<i>Eleventh mile, (passing Little Conococheague, Middle Roff's mills.)</i>					68,773 75

Common excavation.	-	-	1,760	52,800 cubic yards at 10 cents,	5,280 00
1 Culvert, Little Conococheague,	-	-	-	-	1,000 00
1 Road bridge,	-	-	-	-	200 00
					<hr/> 6,480 00

SUBDIVISION No. 4.—Continued.

Twelfth mile.

	Distance, yds.		Dolls. cts.
Common excavation,	1,760	44,000 cubic yards at 10 cents,	\$ 4,400 00

Thirteenth mile.

Common excavation,	1,760	24,640 cubic yards, at 8 cents,	1,971 20
1 Culvert,	-	-	300 00
1 Bridge,	-	-	150 00
<i>Fourteenth mile, (high limestone cliffs, pass the Warehouse.)</i>			2,421 20

River embankment,	1,227	220,860 cubic yards at 35 cents,	77,301 00
Paving the same,	-	17,178 do.	12,883 50
River embankment, edge of the water,	533	39,442 do.	7,888 40
Paving the same,	-	6,396 do.	4,797 00
<i>Fifteenth mile, (pass the Cannon Rocks.)</i>			102,869 90

River embankment,	433	77,940 cubic yards, at 35 cents,	27,279 00
Paving the same,	-	6,062 do.	4,546 50
Common embankment,	26	3,380 do.	338 00
Do. excavation,	1,301	22,117 do.	1,990 53
1 Culvert,	-	-	400 00
1 Farm bridge,	-	-	150 00
			34,704 03

Sixteenth mile.

Common excavation, -	-	1,760	26,400 cubic yards, at 9 cents,	2,376 00
1 Road bridge, -	-	-	-	200 00
Grubbing, -	-	-	-	150 00
<i>1,529 yards, remainder of 4th Sub-division.</i>				<u>2,726 00</u>
Common embankment, over culverts, -	83	-	6,985 cubic yards, at 11 cents,	768 35
Do. N. W. side Conococheague, -	200	-	do. 14 cents,	3,640 00
Do. excavation, -	1,246	-	do. 8 cents,	1,395 52
2 Culverts, -	-	-	-	700 00
1 Farm bridge, -	-	-	-	150 00
<i>End at Great Conococheague.</i>				<u>6,653 87</u>

REMARKS ON THE FOURTH SUBDIVISION.

The feasible portions of this subdivision, amount to 5ms. 1,020 yds.
 Deep cutting, side hill cutting, and embanking to 11 ms. 509 yds.

16 ms. 1,529 yds.

Lockage, 40 feet in 5 locks.

The expense of this subdivision is increased, by keeping up the level to pass Prater's Neck more favorably ; but, on that account, it was judged best to continue the level from Licking creek, and pass that peninsula on the highest level the country would reasonably allow. The expensive parts of this subdivision, and such as would not bear widening, are side hill excavation near Fort Frederick, the cut through Prater's neck, and the river embankment between Prater's neck and Williamsport, in two places.

In these places, the earth is supposed to be brought from the Virginia side of the river, and the price is made to cover that ; and also the expense of the stone basing for the banks, and making a secure lining for the canal. The stone for paving abound wherever they are wanted.

The locks and other stone work can be built very reasonably on this subdivision, as lime and stone, and other materials, are in abundance, and convenient.

A. N. ABSTRACT of the estimates of the 4th Subdivision.

Mile.	To fence & widen. Yds.	Culverts.	Bridges.	Lockage. Feet.	Cost.
1	1760	-	2	-	\$ 12,702 80
2	1493	2	1	-	4,160 80
3	-	1	1	-	4,874 00
4	-	2	2	-	5,828 00
5	-	2	1	-	4,270 00
6	-	1	2	-	5,576 80
7	-	3	3	-	11,876 07
8	-	2	2	32	70,054 80
9	-	2	-	8	65,941 75
10	-	1	-	-	68,773 75
11	-	1	1	-	6,480 00
12	500	-	-	-	4,400 00
13	1760	1	1	-	2,412 20
14	-	-	-	-	102,869 90
15	1301	1	1	-	34,704 03
16	1760	1	1	-	2,726 00
1529 yds.	1246	2	1	-	6,653 87
16m. 1529y. 5 m. 1020 y.	9820 or 9820	22	19	40	\$ 414,304 77

For 5 waste weirs at \$ 200 each,	-	-	1,000 00
14 miles fencing, at \$ 480, -	-	-	6,720 00

Total estimate for a canal of 40 feet surface,	-	\$ 422,024 77
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Of the 4th subdivision, 5 miles and 1,020 yards are on feasible ground, where a canal may be made, 48 feet wide at the surface, with serf berms and locks, 102 feet in the chamber, &c. at the following additional expense, viz.

For widening the canal the above distance, 9,820 yards, at one dollar	-	\$ 9,820 00
lengthening culverts, (only 14) at 55 dollars each	-	770 00
lengthening bridges, nineteen, at 50 dollars	-	950 00
lengthening lockage, 40 feet, at 80 dollars	-	3,200 00

Added to the cost of a canal of 40 feet surface	-	14,740 00
	-	422,024 77

Total estimate of a canal of 48 feet surface,	-	436,764 77
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* To make the feasible parts of the 4th subdivision, as above stated, 60 feet at surface, &c. the following increased expense will be necessary, viz.

For widening the excavation, 9,820 yards, at \$ 1 50	\$14,730 00
lengthening culverts, 14, at 94 dollars each	- 1,316 00
lengthening bridges, 19, at 150 dollars each	- 2,850 00
lengthening lockage, 40 feet, at 80 dollars	- 3,200 00

This added to the cost of the canal of 40 feet surface,	32,096 00
	422,024 77

Total estimated cost of a canal of 60 feet surface	444,120 77
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SUBDIVISION No. 5.—From Williamsport to Antietam creek.

Conococheague Feeder, 5022 yards to Miller's mill dam.

	Distance, yds.		Dolls. cts.
Embanking	-	72,600 cubic yards, at 15 cents,	10,890 00
Paving the same	-	7,700 do at 75 cents,	5,775 00
Excavating on steep hill side	-	1,250 do at 10 cents,	3,375 00
do common	-	2,672 do at 8 cents,	2,137 60
1 Culvert	-	-	300 00
5 Bridges	-	-	900 00
Raising Miller's dam and guard gate	-	-	4,000 00
Raising road above Miller's dam	-	-	1,000 00
Total cost of feeder,	-	-	\$28,377 60

First Mile.

Aqueduct over Conococheague creek, stone, abutments, and piers, and wood trunk, 20 feet wide, and 400 feet long	-	-	20,000 00
Common embankment at foot of hill	-	600	2,352 00
Common excavation	-	1,160	1,484 00
3 Bridges	-	-	1,000 00
1 Lock, 8 feet lift, at \$ 800 per foot lift	-	-	6,400 00
			31,236 80

Second Mile.

River embankment	-	700	99,400 cubic yards, at 20 cents,	19,880 00
Paving the same	-	-	do at 75 cents,	5,775 00
Common embankment	-	30	do at 12½ cents,	412 50
Common excavation	-	1,030	do at 8 cents,	1,236 00
Rock excavation	-	-	do at 50 cents,	250 00
				<u>27,553 50</u>

Third Mile.

Common excavation	-	1,760	26,400 cubic yards, at 9 cents,	2,376 00
1 Culvert	-	-	-	300 00
1 Farm bridge	-	-	-	150 00
Lock No. 2, 8 feet lift, at \$ 800	-	-	-	6,400 00
				<u>9,226 00</u>

Fourth Mile.

River embankment	-	567	20,979 cubic yards, at 20 cents,	4,195 80
Paving the same	-	-	do at 75 cents,	2,976 75
Common embankment	-	16	do at 10 cents,	176 00
Common deep cutting	-	900	do at 10 cents,	3,150 00
Common excavation	-	277	do at 8 cents,	310 24
1 Culvert	-	-	-	360 00
1 Farm bridge	-	-	-	150 00
				<u>11,258 79</u>

SUBDIVISION No. 5.—Continued.

Fifth Mile.

	Distance, yds.		Dolls. cts.
Embankment in river	513	18,981 cubic yards, at 20 cents,	3,796 20
Paving the same	-	do at 90 cents,	4,617 00
Common embankment	17	do at 10 cents,	144 50
Common excavation	1,230	do at 8 cents,	1,574 40
2 Culverts	-	-	600 00
			<u>\$ 10,732 10</u>

Sixth Mile, (Le Fever's Bottom.)

Common excavation	1,760	24,600 cubic yards, at 8 cents,	1,971 20
1 Farm Bridge	-	-	150 00
			<u>2,121 20</u>

Seventh Mile.

Common embankment	33	3,630 cubic yards, at 11 cents,	399 30
Common excavation	1,727	do at 8 cents,	2,210 56
2 Culverts	-	-	650 00
1 Farm bridge	-	-	150 00
Grubbing	-	-	150 00
			<u>3,559 86</u>

Eighth Mile.

River embankment	1,367	154,471 cubic yards, at 25 cents,	38,617 75
Paving the same	-	do at 90 cents,	12,303 00
Common excavation	393	do at 8 cents,	440 16
Lock No. 3, 8 feet lift, at \$ 800 per foot lift	-	-	6,400 00
			<u>57,760 91</u>

Ninth Mile, (opposite Ossacon creek.)

River embankment	-	800	120,000 cubic yards, at 20 cents,	24,000 00
Paving the same	-	-	8,800 do at 90 cents,	7,920 00
Common excavation	-	960	19,200 do at 9 cents,	1,728 00
1 Culvert	-	-	-	350 00
				<u>33,998 00</u>

Tenth Mile.

Common excavation	-	1,760	31,680 cubic yards, at 8 cents,	2,534 40
1 Farm bridge	-	-	-	150 00
				<u>2,684 40</u>

Eleventh Mile, (Sprigg's Mill.)

Common excavation	-	1,760	26,400 cubic yards, at 8 cents,	2,112 00
1 Culvert, for mill race	-	-	-	400 00
1 Farm bridge	-	-	-	150 00
				<u>2,662 00</u>

Twelfth Mile, (passing Galloway's Mill, very high lime rocks.)

Embankment in river, stone base, under bank to surface of water	-	1,760	29,920 cubic yards, at 50 cents,	14,960 00
Embankment to water surface	-	1,760	200,640 do at 25 cents,	50,160 00
Paving the same	-	-	15,840 do at 75 cents,	11,880 00
1 Culvert	-	-	-	350 00
Lock No. 4, 8 feet lift, at \$ 800 per foot lift	-	-	-	6,400 00
				<u>83,750 00</u>

SUBDIVISION No. 5—Continued.

Thirteenth Mile, 1,760 + 366 = 2,126 yards, to lower end of rocks.

	Distance, yds.		Dolls. cts.
Stone base in the river	-	36,142 cubic yards, at 50 cents,	18.07 00
Embankment to water surface	-	do at 25 cents,	65.906 00
Paving the same	-	21,260 do at 75 cents,	15.945 00
1 Culvert	-	-	300 00
			<u>100,222 00</u>

Fourteenth Mile, is only 1,594 yards, (Lynch's bottom.)

Common excavation	-	2,092 cubic yards, at 8 cents,	1.672 80
1 Road bridge	-	-	200 00
			<u>1,872 80</u>

Fifteenth Mile, (Lynch's bottom.)

Common excavation	-	24,640 cubic yards, at 8 cents,	1,971 00
Grubbing	-	-	200 00
			<u>2,171 20</u>

Sixteenth Mile.

Stone under base of bank in river, to surface of water	-	466	2,330 00
Embanking in river	-	-	9,786 00
Paving the same	-	4,194	3,145 50

Common excavation	-	-	1,294	18,116	do	at 8 cents,	1,449 28
Grubbing	-	-	-	-	-	-	100 00
Lock No. 5, 8 feet lift, at \$ 800 per foot lift	-	-	-	-	-	-	6,400 00
							<u>23,210 78</u>

Seventeenth Mile.

Stone base in the river	-	-	1,260	6,300 cubic yards,	at 50 cents,	3,150 00
Embanking the same	-	-	-	30,240 do	at 17 cents,	5,140 80
Paving the same distance	-	-	-	11,340 do	at 75 cents,	8,505 00
Common excavation	-	-	500	15,000 do	at 8 cents,	1,200 00
1 Culvert	-	-	-	-	-	300 00
						<u>18,295 80</u>

Eighteenth Mile.

Common excavation	-	-	1,760	26,400 cubic yards,	at 8 cents,	2,112 00
1 Farm bridge	-	-	-	-	-	150 00
						<u>2,262 00</u>

Nineteenth Mile, (passing Avey's Saw-mill.)

Common embankment	-	-	13	1,430 cubic yards,	at 12½ cents	178 75
Do. excavation	-	-	1,747	26,205 do	at 8 cents	2,096 40
1 culvert, 15 feet span	-	-	-	-	-	1,200 00
1 farm bridge	-	-	-	-	-	150 00
Grubbing	-	-	-	-	-	50 00
						<u>3,675 15</u>

SUBDIVISION No. 5—Continued.

Twentieth Mile, (passing Suke's Landing.)

	Distance, yds.		Dolls. cts.
River embankment	-	43,000 cubic yards, at 17 cts.	7,310 00
Paving the same	-	5,000 do at 90 cts.	4,500 00
Common excavation	-	10,640 do at 8 cts.	851 20
2 culverts	-	-	600 00
1 road bridge	-	-	200 00
Grubbing	-	-	100 00
<i>Twenty-first Mile.</i>			<u>13,561 20</u>

Common excavation	-	24,640 cubic yard at 8 cts.	1,971 20
1 farm bridge	-	-	150 00
<i>Twenty-second Mile.</i>			<u>2,121 20</u>

Common excavation	-	24,640 cubic yards, at 8 cts.	1,971 20
2 farm bridges	-	-	300 00
Lock No. 6, 8 feet lift, at \$800 per foot	-	-	6,400 00
<i>Twenty-third Mile.</i>			<u>8,671 20</u>

Common excavation	-	24,640 cubic yards, at 8 cts.	1,971 20
1 occupation bridge	-	-	150 00
			<u>2,121 20</u>

Twenty-fourth Mile.

Stone base in river to surface of water	-	916	15,572 cubic yards, at 50 cts.	7,786 00
Embanking the same	-	1,016	do. at 20 cts.	32,918 40
Paving the same	-	-	do. at 75 cts.	8,382 00
Common excavation	-	744	do. at 10 cts.	2,232 00
1 culvert for mill race	-	-	-	400 00
1 road bridge	-	-	-	200 00
				<u>51,918 40</u>

Twenty-fifth Mile.

Stone base to water surface, to embank and pave on	-	400	6,800 cubic yards, at 50 cts.	3,400 00
Embanking the same	-	500	do. at 17 cts.	11,985 00
Paving the same	-	-	do. at 80 cts.	4,400 00
Common excavation	-	1,260	do. at 8 cts.	1,411 20
				<u>21,196 20</u>

Twenty-sixth Mile.

River embankment	-	300	24,000 cubic yards, at 17 cts.	4,080 00
Paving the same	-	-	do. at 75 cts.	1,800 00
Common excavation	-	1,460	do. at 8 cts.	1,635 20
1 culvert	-	-	-	300 00
1 farm bridge	-	-	-	150 00
Lock No. 7, 8 feet lift, at \$800 per foot	-	-	-	6,400 00
				<u>14,365 20</u>

SUBDIVISION No. 5.—Continued.

Twenty-seventh Mile.

	Distance, yds.		Dolls. cts.
Stone under base of bank to surface of water			
in river -	1,460	16,060 cubic yards at 50 cents, -	8,030 00
Embanking the same, 1,460 -	-	128,480 do. at 25 cents,	32,120 00
Paving the same -	-	11,680 do. at 75 cents,	8,760 00
Common excavation -	300	14,100 do. at 10 cents,	1,410 00
			<u>\$50,320 00</u>

Twenty-eighth Mile, (opposite Shepherd's Town.)

Deep excavation across the road to the ferry	700	33,600 cubic yards at 10 cents,	3,360 00
Common excavation -	1,060	15,900 do. at 8 cents,	1,272 00
1 road bridge (to ferry) -	-	- - -	200 00
			<u>4,832 00</u>

Twenty-ninth Mile, (passing a large Stone Mill on the Virginia side.)

Common excavation -	1,760	24,640 cubic yards at 8 cents,	1,971 20
2 culverts -	-	- - -	600 00
1 farm bridge -	-	- - -	150 00
			<u>2,721 20</u>

Thirtieth Mile.

Common embankment over culverts -	17	1,870 cubic yards, at 12½ cents,	233 75
Do excavation -	1,743	24,402 do. at 8 cents,	1,952 16

1 culvert	-	-	-	300 00
1 road bridge	-	-	-	200 00
Grubbing and moving road	-	-	-	500 00
				<u>3,185 91</u>

257 yards, remainder of the 5th subdivision.

Common embankment	-	-	190	20,900	cubic yards, at 14 cts.	2,926 00
Do. excavation	-	-	67	1,005	do. at 8 cts.	80 40
1 farm bridge	-	-	-	-	-	150 00
						<u>3,156 40</u>

End at Antietam creek.

REMARKS.

At the commencement of the 5th subdivision, the Great Conococheague has been included in these estimates, as a feeder, to supply the canal to Harper's Ferry. In all other cases, access has been had to the Potomac, whose supply, as a feeder, may be considered as inexhaustible. But the river, in this vicinity, has but little fall for several miles, and the floods rise very high, so that by locking down, to reach the river as a feeder, a very expensive deep cut, and long and high guard bank against the floods, would be unavoidable.

AN ABSTRACT of the estimates of the 5th Subdivision.

Miles.	To fence and widen. Yards.	Culverts.	Bridge.	Lockage. feet.	Cost per mile.
1	1,760	-	3	8	\$31,236 80
2	1,060	-	-	-	27,553 50
3	1,760	1	1	8	9,226 00
4	1,193	1	1	-	11,258 79
5	1,247	2	-	-	10,732 10
6	1,760	-	1	-	2,121 20
7	1,760	2	1	-	3,559 86
8	393	-	-	8	57,760 91
9	960	1	-	-	33,998 00
10	1,760	-	1	-	2,684 40
11	1,760	1	1	-	2,662 00
12	-	1	-	8	83,750 00
13+	-	-	-	-	100,222 00
14—	1,394	-	1	-	1,872 80
15	1,760	-	-	-	2,171 20
16	1,294	-	-	8	23,210 78
17	500	1	-	-	18,295 80
18	1760	-	1	-	2,262 00
19	1760	1	1	-	3,675 15
20	760	2	1	-	13,561 20
21	1760	-	1	-	2,121 20
22	1760	-	2	8	8,671 20
23	1760	-	1	-	2,121 20
24	744	1	1	-	51,918 40
25	1200	-	-	-	21,196 20
26	1460	1	1	8	14,365 20
27	300	-	-	-	50,320 00
28	1060	-	1	-	4,832 00
29	1760	2	1	-	2,721 00
30	1760	1	1	-	3,185 91
257 yds.	67	-	1	-	3,156 40
30 m. 257 yds	38,332 21m. 1372yds	19	23	56	\$634,800 40

For 12 waste weirs, at \$200 each,	-	2,400 00
For 21 miles 1,372 yds. fencing, at \$480 per mile,		10,454 18

Total estimate of a canal of 40 feet surface, &c.	-	<u>\$647,654 58</u>
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Of the 5th subdivision, 21 miles and 1,372 yards are on very feasible ground, where a canal of 48 feet surface with surf beams, and five feet depth of water, can be made for the following additional expense, viz :

For widening the canal 38,332 yards at \$1 per yard,	\$38,332 00
For lengthening 19 culverts at \$55 each,	- 1,045 00
do 23 bridges at \$50 each,	- 1,150 00
do lock 56 feet at \$80 per foot,	- 4,480 00

Amount of additions,	- - - -	\$45,007 00
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To be added to the cost of the 40 feet surface canal,		<u>647,654 58</u>
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Total estimate of a canal of 48 feet surface,	-	<u>\$692,661 58</u>
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The feasible parts of the 5th subdivision may be made 60 feet at surface, 5 feet depth of water, and the locks 102 feet in the chamber, for the following additional expenses, viz :

For widening the canal 21 miles and 1,372 yds. at \$1 50	\$57,498 00
For lengthening culverts, 19, at \$94 each,	- 1,786 00
do bridges, 23, at \$150 each,	- 3,450 00
do lockage, 56 feet, at \$80 per foot,	- 4,480 00

Amount of additions	- - - -	\$67,214 00
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To be added to the expense of the 40 feet canal,	-	<u>647,654 58</u>
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Total cost of a canal of 60 feet surface,	-	<u>\$714,868 58</u>
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SUBDIVISION No. 6.

From Antietam Creek, to one mile below Harper's Ferry.

First Mile.

	Distance, yds.	Dolls. cts.
Aqueduct over Antietam Creek, stone piers and abutments and trunk of wood, length	80	\$ 11,472 00
Common excavation	1680	2,016 00
2 road bridges	-	400 00
Lock No. 1, 8 feet lift, at \$ 800 per foot lift	-	6,400 00

\$ 20,288 00

Second Mile.

Common excavation	1,760	24,640 cubic yards, at 8 cents,	1,971 20
Removing rocks	-	450 do at 50 cents,	225 00
Paving bank in river, 150	-	1,200 do at 75 cents,	900 00
Grubbing and moving road	-	-	1,000 00

4,096 20

Third Mile.

River embankment	866	25,980 cubic yards, at 12½ cents,	3,247 50
Paving the same	-	6,928 do at 75 cents,	5,196 00
Rocky points to cut	-	400 do at 50 cents,	200 00
Common excavation	894	13,410 do at 8 cents,	1,072 80
1 culvert	-	-	300 00
1 farm bridge	-	-	150 00
Grubbing	-	-	150 00

10,316 30

Fourth Mile.

Stone base for river embankments	-	334	4,342 cubic yards, at 50 cents,	2,171 00
Embankment in river	-	-	do do at 20 cents,	5,878 40
Paving the same	-	-	do do at 75 cents,	2,004 00
Cutting points of rocks	-	-	do do at 50 cents,	250 00
Common excavation	-	1,426	do do at 8 cents,	1,711 20
1 farm bridge	-	-	- - -	150 00
Grubbing	-	-	- - -	150 00
				<u>12,314 60</u>

Fifth Mile.

Common embankment	-	117	10,530 cubic yards, at 12½ cts.,	1,316 25
do excavation	-	1,643	do do at 8 cents,	1,840 16
2 culverts	-	-	- - -	700 00
2 farm bridges	-	-	- - -	300 00
				<u>4,156 41</u>

Sixth Mile.

Common embankment	-	1,760	44,000 cubic yards, at 9 cents,	3,960 00
1 culvert	-	-	- - -	300 00
Lock No. 2, 8 feet lift, at \$800 per foot	-	-	- - -	6,400 00
				<u>10,660 00</u>

SUBDIVISION No. 6.—Continued.

(Seventh Mile, passing an iron ore bed.)

	Distance, yds.		Dolls. cts.
Stone base in the river -	367	5,670 cubic yards, at 50 cents,	1,835 00
Embankment in do -	-	17,616 do at 20 cents, -	3,523 20
Paving the same -	-	2,202 do at 80 cents, -	1,761 60
Rocky points to cut -	-	100 do at 50 cents, -	50 00
Common excavation -	1,393	20,895 do at 8 cents, -	1,671 60
1 farm bridge -	-	- - -	150 00
Grubbing -	-	- - -	150 00
			<hr/>
			\$9,141 40

Eighth Mile, (commences near the head of Harper's Ferry Falls.)

Batteral wall 14 feet high -	1,760	14,080 cubic yards, at 1 dollar	14,080 00
Pounded stone in the bottom of canal, under the lining -	-	21,520 do at 75 cents, -	15,990 00
Embanking and lining of earth including labor of puddling -	-	41,000 do at 37½ cts., -	15,375 00
2 culverts -	-	- - -	600 00
Locks Nos. 3, 4, and 5, lift 24 feet, at \$ 800 per foot -	-	- - -	19,200 00
			<hr/>
			65,245 00

Ninth Mile, (passes the bridge at Harper's Ferry.)

Batteral wall, dry -	1,100	8,800 cubic yards, at 1 dollar -	8,800 00
Rock excavation -	-	16,500 do at 40 cents, -	6,600 00
do do below bridge -	93	2,325 do at 40 cents, -	930 00
Lining the canal with puddle -	-	13,200 do at 25 cents, -	3,300 00

Wall for towing-path in edge of the river from above the bridge, past the dam and guard lock	567	8,505	do	at 1 dollar	-	8,505 00
Protecting wall and pier above the dam	126	1,890	do	at 1 dollar	-	1,890 00
Dam across the Potomac below the mouth of Shenandoah, to raise the water three feet above low water, for a basin and feeder. Length of dam 750 feet, at \$6 per foot run	-	-	-	-	-	4,500 00
Locks Nos. 6 and 7, of 8 feet each, to lock with the river above the bridge, and guard lock, near the dam of 12 feet lift. Lockage 28 feet, at \$800 per foot	-	-	-	-	-	22,400 00
2 bridges to change towing-path	-	-	-	-	-	100 00
						<u>57,025 00</u>

1,099 yds. being the remainder of the 6th Subdivision.

Rock excavation	-	-	500	11,500 cubic yards, at 40 cents,	-	4,600 00
Common excavation	-	-	599	do	at 8 cents,	670 88
Moving the road from the ferry to the end of the division, 1 mile	-	-	-	-	-	2,000 00
						<u>7,270 88</u>

End one mile below Harper's Ferry.

REMARKS.

On the sixth subdivision, below the junction of the Shenandoah with the Potomac, a dam is calculated, to raise the water about three feet, or so high as not to injure the hydraulic power at the public works. This will form the third spacious basin in the Potomac, and, at this point especially, it would be of great public utility to the establishment of the United States at Harper's Ferry, as well as the trade of the Shenandoah. It is computed that this feeder, from the Potomac, will supply the canal to the head of the Seneca Falls, and supersede the necessity of resorting to the Monocacy or Seneca creeks, and thereby save the damage done to mill owners, which must be considerable, if those streams were diverted from their present channels. It may be here observed, that those streams have been surveyed for feeders, as may be seen on the maps; but, for the above reasons, are not included in these estimates.

AN ABSTRACT of the estimates of the 6th Subdivision.

Miles.	To fence and widen. yds.	Culverts.	Bridges.	Lockage. Feet.	Cost per mile.
1	1680	-	2	8	\$ 20,288 00
2	1760	-	-	-	4,096 20
3	894	1	1	-	10,316 30
4	1426	-	1	-	12,314 60
5	1643	2	2	-	4,156 41
6	1760	1	-	8	10,660 00
7	1593	-	1	-	9,141 40
8	-	2	-	24	65,245 00
9	-	-	-	16&1grd.	57,025 00
Rem. 1,099yds	1099	-	-	-	2,270 88
9 m. 1099 y.	11,655 6m. 1095 y.	6	7	56	\$200,513 79

To the above add, for four waste weirs, at \$200 - 800 00

Fencing six miles 1,095 yards, at \$480 - 3,178 63

Cost of the sixth subdivision, for a 40 feet canal, \$ 204,492 42

The *feasible* parts of the sixth subdivision, amount to six miles 1,095 yards, on which a canal 48 feet at the water line. five feet in depth, with surf berms each side, two feet horizontal, and locks 102 feet in the chamber, can be made at the following additional expense :-

For widening the canal, &c. 11,655 yards, at \$ 1	-	\$ 11,655 00
For lengthening 6 culverts, at \$ 55 each	-	330 00
For do 7 bridges, at \$ 50 each	-	350 00
For do 8 locks, (1 a guard lock) 68 feet, at \$ 80	-	5,440 00
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Amount added to	-	17,775 00
The cost of a canal of forty feet surface	-	204,492 42
<hr/>		
The cost of a canal of 48 feet surface	-	\$ 222,267 42
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The feasible parts of the sixth subdivision, as above, may be made sixty feet wide, at the following additional expense, viz :

Widening the canal 11,655 yds. at \$ 150	-	17,452 50
Lengthening 6 culverts, at \$ 94	-	564 00
do 7 bridges at \$ 150	-	1,050 00
do 68 feet lockage, at \$ 80	-	5,440 00
<hr/>		
		24,536 50
Add the expense of a 40 feet canal	-	204,492 42
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Cost of a 60 feet canal	-	\$ 229,028 92
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SUBDIVISION No. 7.—From one mile below Harper's Ferry, to the Monocacy.

First Mile.

	Distance, yds.		Dolls. cts.
River embankment	833	44,982 cubic yards, at 20 cents -	8,996 40
Paving the same	-	do at 75 cents -	3,748 50
Common excavation	927	do at 10 cents -	1,297 80
Moving road (passing rocks)	-	-	3,000 00
1 farm bridge	-	-	150 00
			<u>\$17,192 70</u>

Second Mile, (passing Weaver's Mills.)

Common embankment	66	2,310 cubic yards, at 10 cents -	231 00
do excavation	1,694	do at 8 cents -	1,897 28
2 culverts	-	-	700 00
2 farm bridges	-	-	300 00
1 lock, 8 feet lift, at \$ 800 per foot	-	-	6,400 00
			<u>9,528 28</u>

Third Mile, (Mr. Langanboteler's Plantation.)

Common embankment	17	765 } 25,167 cubic yds. at 8 cts. 2,013 36	
do excavation	1,743	24,402 }	
2 culverts	-	-	600 00
2 farm bridges	-	-	300 00
			<u>2,913 36</u>

Fourth Mile.

Common embankment	-	-	SS	2,475 cubic yards, at 10 cents, -	247 50
do excavation	-	-	1,727	24,176 do at 8 cents, -	1,934 24
3 culverts	-	-	-	- - -	1,000 00
1 farm bridge	-	-	-	- - -	150 00
Grubbing	-	-	-	- - -	100 00
					<u>3,431 74</u>

Fifth Mile, (passes the town of Berlin.)

Common embankment	-	-	100	8,500 cubic yards, at 10 cents, -	850 00
do excavation	-	-	1,660	23,240 do at 9 cents, -	2,091 60
2 culverts	-	-	-	- - -	600 00
2 road bridges	-	-	-	- - -	400 00
					<u>3,941 60</u>

Sixth Mile.

Common embankment	-	-	SS	2,805 cubic yards, at 10 cents, -	280 50
do excavation	-	-	1,727	24,178 do at 8 cents, -	1,934 24
1 culvert	-	-	-	- - -	300 00
2 farm bridges	-	-	-	- - -	300 00
Grubbing	-	-	-	- - -	200 00
					<u>3,014 74</u>

SUBDIVISION No. 7.—Continued.

Seventh Mile.

	Distance, yds.	1,105 cubic yards, at 10 cents, do at 8 cents,	Bolls, cts.
Common embankment	- 13		110 50
Common excavation	- 1,747	24,458	1,956 64
1 Culvert	-	-	400 00
1 Farm bridge	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot	-	-	6,400 00
			<u>\$ 9 017 14</u>

Eighth Mile.

Embankment over culverts	- 75	7,875 cubic yards, at 10 cents,	787 50
Common excavation	- 1,685	do at 8 cents,	1,887 20
2 Culverts (one 10 feet)	-	-	1,300 00
1 Farm bridge	-	-	150 00
			<u>4,124 70</u>

Ninth Mile, (crosses Cotocotin creek.)

Common embankment	- 78	7,964 cubic yards, at 11 cents,	876 04
Common excavation	- 1,682	do at 9 cents,	2,119 32
Aqueduct at Cotocotin creek	-	-	2,000 00
1 Culvert	-	-	300 00
1 Farm bridge	-	-	150 00
			<u>5,445 36</u>

Tenth Mile, (passes Cotocotin mountain.)

River embankment	-	-	783	46,980 cubic yards, at 18 cents,	8,456 50
Paving the same	-	-	-	do at 75 cents,	4,110 75
Rocky points to cut	-	-	-	do at 50 cents,	250 00
Common excavation	-	-	977	do at 10 cents,	1,954 00
1 Culvert (saw-mill race)	-	-	-	-	400 00
1 Farm bridge	-	-	-	-	150 00
1 Lock, 8 feet lift, at \$ 800 per foot	-	-	-	-	6,400 00
					<u>21,721 25</u>

Eleventh Mile.

Common excavation	-	-	1,760	31,680 cubic yards, at 9 cents,	2,851 20
1 Farm bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	100 00
					<u>3,101 20</u>

Twelfth Mile.

River embankment	-	-	688	77,179 cubic yards, at 35 cents,	27,012 65
Paving the same	-	-	-	do at 75 cents,	5,122 50
Rocky points to cut	-	-	-	do at 50 cents,	75 00
Common excavation	-	-	1,077	do at 8 cents,	1,292 40
2 Culverts	-	-	-	-	600 00
1 Farm bridge	-	-	-	-	150 00
					<u>34,252 55</u>

SUBDIVISION No. 7.—Continued.

Thirteenth Mile, 100 yds. to include all the river embankings.

	Distance, yds.		Dolls. cts.
Embankment in river	-	122,590 cubic yards, at 35 cents,	42,906 50
Paving the same	-	do at 1 dollar,	7,462 00
Common embankment	-	do at 10 cents,	220 00
Common excavation	-	do at 9 cents,	1,646 82
1 Culvert	-	-	400 00
1 Bridge (to ferry)	-	-	200 00
			<u>\$52,835 32</u>

Fourteenth Mile, less 100=1660 (opposite Kemp's Island.)

Common excavation	-	21,580 cubic yards, at 8 cents,	1,726 40
1 Farm bridge	-	-	150 00
			<u>1,876 40</u>

Fifteenth Mile.—Carroll's Manor, (alluvial bottom.)

Common embankment over culvert	-	50	2,250
Common excavation	-	1,710	22,230
			<u>24,480 cubic yds. at 7 cts.</u>
1 Culvert,	-	-	1,713 60
1 Farm bridge,	-	-	300 00
			150 00
			<u>2,163 60</u>

Sixteenth Mile, (passes Nolen's Ferry.)

Common embankment,	-	331	27,410		
Common excavation,	-	1,439	28,780		
Rock to excavate,	-	-	56,190 cubic yards, at 11 cents,	6,180 90	
5 Culverts,	-	-	300 do at 50 cents,	150 00	
1 Road bridge,	-	-	-	2,200 00	
	-	-	-	200 00	
					8,730 90

Seventeenth Mile (Mr. Eagle's.)

Common embankment,	-	749	33,380 cubic yards, at 11 cents,	3,671 80	
Common excavation,	-	1,011	15,165 do at 8 cents,	1,213 20	
3 Culverts,	-	-	-	900 00	
2 Bridges, (1 road)	-	-	-	350 00	
					6,135 00

1,146 yds. Remainder of the 7th subdivision.

Embankment at Monocacy,	-	123	11,685		
Do.	-	10	2,700		
Common excavation,	-	-	14,385 cubic yards, at 11 cents,	1,582 35	
1 Culvert,	-	1,013	20,260 do at 8 cents,	1,630 80	
1 Farm bridge,	-	-	-	300 00	
	-	-	-	150 00	
					3,653 15

End at Monocacy creek.

AN ABSTRACT of the estimates of the 7th Subdivision.

Miles.	Feasible parts to be fenced and widened.	Culverts.	Bridges.	Lockage.	Cost per mile.
1	927	-	1	-	\$ 17,192 70
2	1,694	2	2	8	9,528 28
3	1,743	2	2	-	2,913 36
4	1,727	3	1	-	3,431 74
5	1,660	2	2	-	3,941 60
6	1,727	1	2	-	3,014 74
7	1,747	1	1	8	9,017 14
8	1,685	2	1	-	4,124 70
9	1,682	2	1	-	5,445 36
10	-	1	1	8	21,721 25
11	1,760	-	1	-	3,101 20
12	1,077	2	1	-	34,252 55
13	1,307	1	1	-	52,835 32
14	1,660	-	1	-	1,876 40
15	1,710	1	1	-	2,163 60
16	1,439	5	1	-	8,730 90
17	1,011	3	2	-	6,135 00
Rem. 1146 yds	500	1	1	-	3,653 15
17 m. 1,146 yds.	25,056 yds 14 m. 416 y.	29	23	24 ft.	\$ 193,078 99

Add to the above, for 5 waste weirs, at \$ 200 - 1,000 00
Do. fencing 16 miles, at \$ 480 per mile, 7,680 00

Total cost for a canal of 40 feet surface, &c. - \$ 201,758 99

The feasible parts of the 7th subdivision amount to 14 miles, and 416 yards, on which a canal of 48 feet surface, &c. can be made, as follows, viz :

For widening and deepening the excavation 25,056 yds.

at \$ 1 00 per yard - - - - \$ 25,056 00

- For lengthening 29 — 4 = 25 culverts, at \$ 55 each 1,375 00

lengthening 22 bridges, at \$ 50 each 1,100 00

lengthening lockage, 24 ft. at \$ 80 pr. foot lift 1,920 00

To this amount, - - - - \$ 29,451 00

Add the expense of the canal of 40 feet surface - 201,758 99

Makes the expense of a canal, of 48 feet surface,
amount to - - - - \$ 231,209 99

To enlarge the canal on the feasible parts of the 7th subdivision, as above stated, to 60 feet surface, with proportional breadth at bottom, 5 feet depth of water, and locks 102 feet long, the following additional expense must be incurred, viz :

Widening and deepening the excavation, 25,056 yds.

at \$ 1 50 per yard	-	-	-	\$ 37,584 00
Lengthening 25 culverts, at \$ 94	-	-	-	2,350 00
Do 22 bridges, at 1 50	-	-	-	3,300 00
Do 24 ft. of lockage, at \$ 80 per ft.	-	-	-	1,920 00

To the amount of these additions	-	-	\$ 45,154 00
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Add the amount of a 40 feet surface canal	-	-	201,758 99
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Makes the canal of 60 feet cost	-	-	\$ 246,912 99
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SUBDIVISION No. 8.—*From the mouth of the Monocacy to the mouth of Seneca creek.**First Mile.*

	Distance, yds.	Dolls. cts.
Aqueduct over the Monocacy, stone abutments, and piers, and trunk of wood, 20 feet wide, and 153 feet long	-	- 20,000 00
Common embankment	-	1,560 80
Do do and excavation	67	3,264 00
Do do do	816	1,071 36
1 Culvert for Little Monocacy, 10 ft. chord	744	800 00
1 Small, 4 feet chord	-	300 00
1 Road bridge	-	200 00
Grubbing	-	200 00
Lock No. 1, lift 8 feet, at \$ 800 per foot	-	6,400 00
		<hr/>
		\$ 33,736 16

Second Mile.

Stone basing in river	-	2,268 cubic yards, at 50 cents	1,138 00
Embanking in do	567	do at 18 cents	10,716 30
Paving the same	-	do at 75 cents	3,827 25
Common embankment	-	do at 11 cents	121 00
Do excavation	20	do at 8 cents	1,313 76
1 Culvert	1,173	-	300 00
Grubbing	-	-	150 00
			<hr/>
			17,566 31

Third Mile.

Common embankment	-	1,815 cubic yards, at 11 cents	199 65
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Common excavation	-	-	1,727	24,178	do	at 8 cents	1,934 24
1 Culvert	-	-	-	-	-	-	350 00
1 Bridge	-	-	-	-	-	-	150 00
Lock No. 2, 8 feet, at \$ 800 per foot	-	-	-	-	-	-	6,400 00
							<hr/> 9,033 89

Fourth Mile, (lime rocks abound.)

Embankment in the river	-	833	73,304 cubic yards, at 20 cents	14,660 80
Paving the same	-	-	do at 75 cents	4,998 00
Common embankment	-	10	do at 10 cents	55 50
Do excavation	-	917	do at 8 cents	1,027 04
2 Culverts	-	-	-	600 00
1 Bridge	-	-	-	150 00
Grubbing	-	-	-	200 00
				<hr/>
				21,691 34

Fifth Mile, (passing the marble quarry, where the columns of the Capitol were obtained.)

Stone basing in the river	-	-	917	3,668 cubic yards at 40 cents	1,467 20
Embanking do	-	-	-	80,696 do at 20 cents	16,139 20
Paving the same	-	-	-	7,336 do at 75 cents	5,502 00
Common embankment	-	-	10	1,400 do at 11 cents	154 00
Common excavation	-	-	833	16,660 do at 9 cents	1,499 40
Two culverts	-	-	-	-	600 00
One bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	150 00
					<hr/> 25,661 80

SUBDIVISION No. 8.—Continued.

Sixth mile, (on Trunnel's bottom.)

	Distance, yds.	61,600 cubic yards, at 10 cents	Dolls. cts.
Common excavation	- 1,760	-	6,160 00
Two culverts	-	-	600 00
One bridge	-	-	150 00
			<u>\$ 6,910 00</u>

Seventh mile.

Common embankment	- 84	4,620 cubic yards, at 10 cents	462 00
Common excavation	- 1,676	23,464 do at 8 cents	1,877 12
Four culverts	-	-	1,200 00
One bridge	-	-	150 00
Grubbing	-	-	50 00
			<u>3,739 12</u>

Eighth mile.

Common embankment	- 80	6,000 cubic yards, at 10 cents	600 00
Common excavation	- 1,680	26,880 do at 8 cents	2,150 40
Two culverts	-	-	600 00
One bridge	-	-	150 00
			<u>3,500 40</u>

Ninth mile, (passing over Hillary's Bottom.)

Common embankment	-	-	50	2,500 cubic yards, at 10 cents	250 00
Common excavation	-	-	630	18,900 do at 9 cents	1,701 00
Paving a part, 680	-	-	-	6,120 do at \$1 00	6,120 00
Common excavation	-	-	1,080	15,120 do at 8 cents	1,209 60
One culvert	-	-	-	-	350 00
One farm bridge	-	-	-	-	150 00
					<u>9,780 60</u>

Tenth mile, (Wheeler's Bottom.)

Common embankment	-	-	17	1,122 cubic yards, at 11 cents	123 42
Common excavation	-	-	1,743	24,402 do at 8 cents	1,952 16
One culvert	-	-	-	-	300 00
One farm bridge	-	-	-	-	150 00
					<u>2,525 58</u>

Eleventh mile, (on Aldridge's Bottom and Broad Run.)

Common embankment	-	-	50	3,300 cubic yards, at 11 cents	563 00
do	-	-	83	9,960 do at 12½ cents	1,245 00
Common excavation	-	-	1,627	22,778 do at 8 cents	1,822 24
One culvert	-	-	-	-	300 00
One culvert, 14 feet, for Broad Run	-	-	-	-	1,200 00
One farm bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	100 00
					<u>5,180 24</u>

SUBDIVISION No. 8.—Continued

Twelfth mile, (passing Edward's Ferry.)

	Distance, yds.		Dolls. cts.
Common excavation	-	24,640 cubic yards, at 8 cents	1,971 20
Two bridges	-	-	350 00
			<hr/>
<i>Thirteenth mile, (Fletcher's Bottom.)</i>			
Common embankment	-	2,805 cubic yards, at 11 cents	308 55
Common excavation	-	24,178 do at 8 cents	1,934 24
One culvert	-	-	350 00
One farm bridge	-	-	150 00
Grubbing	-	-	100 00
			<hr/>
			\$ 2,321 20
			<hr/>

Fourteenth mile, (Fletcher's Bottom.)

Common excavation	-	26,400 cubic yards, at 8 cents	2,112 00
One culvert	-	-	300 00
Two bridges	-	-	300 00
Lock No. 3, lift eight feet, at \$ 800 per foot	-	-	6,400 00
			<hr/>
			9,112 00
			<hr/>

Fifteenth mile, (parallel and near to Georgetown road.)

Common excavation	-	28,160 cubic yards, at 9 cents	2,534 40
One culvert	-	-	300 00
			<hr/>

SUBDIVISION No. 8.—Continued.

Nineteenth mile, (passing the Seneca Stone Quarry.)

	Distance, yds.		Dolls. cts.
Common embankment	-	3,000 cubic yards, at 14 cents	420 00
Common excavation	-	do at 12½ cents	6,412 50
Paving a part	-	do at 75 cents	2,100 00
Two culverts	-	-	600 00
Two bridges	-	-	400 00
Turning a creek in a new channel	-	-	30 00
Grubbing, heavy	-	-	400 00
			<hr/>
			\$ 10,362 50

Remainder 131 yards. Remainder of the Eighth Subdivision.)

Common embankment	-	500	15,000 cubic yards, at 12½ cents	1,875 00
Common embankment at Seneca creek	-	100	do at 14 cents	700 00
Common excavation	-	531	do at 8 cents	594 72
One culvert	-	-	-	300 00
One farm bridge	-	-	-	150 00
Grubbing	-	-	-	75 00
				<hr/>
				3,694 72
				<hr/>
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End at Seneca creek.

AN ABSTRACT of the Estimates of the 8th Subdivision.

Distance.	To fence and widen.	Culverts.	Bridges	Lockage ft	Cost per mile.
1	1,627	2 & 1 aqne.	1	8	\$ 33,736 16
2	1,173	1	-	-	17,566 31
3	1,760	1	1	8	9,033 89
4	927	2	1	-	21,691 34
5	843	2	1	-	25,661 80
6	1,760	2	1	-	6,910 00
7	1,760	4	1	-	3,739 12
8	1,760	2	1	-	3,500 40
9	1,445	1	1	-	9,780 60
10	1,760	1	1	-	2,525 58
11	1,760	2	1	-	5,180 24
12	1,760	-	2	-	2,321 21
13	1,760	1	1	-	2,842 79
14	1,760	1	2	8	9,112 00
15	1,760	1	-	-	3,034 40
16	1,760	1	1	-	3,684 00
17	1,760	1	1	-	3,442 80
18	1,760	1	1	-	3,918 00
19	1,760	2	2	-	10,362 50
Rem 1,131 yds.	1,131	1	1	-	3,694 72
19m 1,131 yds.	31,876 yds. or 18 m. 106 yds.	30	21	24 ft	\$ 181,737 85

Add to the above, for 6 waste weirs - - - 1,200 00
 Fencing 18 miles 106 yards, at 480 dollars per mile 8,668 90

Total cost of the 8th subdivision for a 40 feet canal \$ 191,606 75

The feasible parts of the 8th subdivision amount to 18 miles 106 yards; on which a canal of 48 feet at surface, with surf-berms, 2 feet horizontal on each side, and 5 feet depth of water, and the locks 102 feet in chamber, &c., can be made for the additional expense, as follows, viz :

For widening and deepening the canal, 31,786 yards,
 at 1 dollar - - - - - \$ 31,786 00
 For lengthening 30 culverts, at 55 dollars - - - 1,650 00
 Do do 21 bridges, at 50 dollars - - - 1,050 00
 Do do 24 feet lockage, at 80 dollars per foot 1,920 00

Amount - - - - - \$ 36,406 00
 To be added to the cost of the 40 feet canal - 190,606 75

Makes the cost of the 48 feet canal amount to \$ 228,012 75

To increase the width of the canal to 60 feet, with width proportionate at bottom, and 5 feet depth of water, and locks 102 feet long, the additions to be made on the feasible parts of the 8th subdivision, are as follows, viz :

For widening the excavation 31,786 yards, at 1 dollar 50 cents	-	-	-	-	\$ 47,679 00
For lengthening 30 culverts, at 94 dollars	-	-	-	-	2,820 00
Do do 21 bridges, 150 dollars	-	-	-	-	3,150 00
Do do 24 feet of lockage, at 80 dollars	-	-	-	-	1,920 00
Amount	-	-	-	-	\$ 55,569 00
To which add the cost of the 40 feet canal,					191,606 75
Makes the cost of the 60 feet canal amount to					<u>\$ 247,175 75</u>

SUBDIVISION No. 9.—From Seneca Creek to the head of the Great Falls of the Potomac.

First mile.

	Distance, yds.	Dolls. cts.
Aqueduct over Seneca creek, abutments and piers of stone, trunk of wood—20 feet wide, and 120 feet long	-	5,128 32
Common excavation	-	2,064 00
One culvert	1,720	300 00
One farm bridge	-	150 00
Lock No. 1, eight feet lift, at 800 dollars per foot	-	6,400 00
		<hr/>
		\$ 14,042 82

Second mile. (Feeder taken in at the head of Seneca Falls.)

Stone basing in the river	1,016	10,160 cubic yards, at 50 cents	5,080 00
Embanking on the same	-	60,960 do at 25 cents	15,240 00
Paving the same	-	11,176 do at 75 cents	8,382 00
Points of rock to cut away	-	400 do at 50 cents	200 00
Common excavation,	744	14,880 do at 10 cents	1,488 00
Dam across the Potomac, and a feeder taken into the canal, at the head of Seneca Falls	-	-	10,000 00
Grubbing	-	-	200 00
Lock No. 2, lift 8 feet, at 800 dollars per foot	-	-	6,400 00
			<hr/>
			46,990 00

Third mile, (crossing Muddy Branch.)

Common embankment	50	6,250 cubic yards, at 14 cts.	875 00
Do. excavation	1,710	25,650 do. at 9 cts.	2,308 50
Moving large rocks	-	-	200 00
Culvert at Muddy Branch, 14 feet	-	-	1,200 00
1 Farm bridge	-	-	150 00
			<hr/>
			4,738 50

SUBDIVISION No. 9—Continued.

Fourth Mile.

	Distance, yds.		Dolls. cts.
Stone basing in the river	190	1,330 cubic yards, at 50 cts.	665 00
Embanking in do.	-	15,390 do. at 20 cts.	3,078 00
Paving the same	-	1,520 do. at 75 cts.	1,140 00
Stone basing in river	250	4,250 do. at 50 cts.	2,125 00
Embanking in do.	-	20,250 do. at 20 cts.	4,050 00
Paving the same	-	2,000 do. at 75 cts.	1,500 00
Common excavation	1,320	19,800 do. at 9 cts.	1,782 00
3 culverts	-	-	900 00
1 farm bridge	-	-	150 00
			<hr/>
			\$ 15,390 00

Fifth Mile.

Stone basing in the river	1,325	6,625 cubic yards, at 50 cts.	3,312 50
Embanking do.	-	79,500 do. at 20 cts.	15,900 00
Paving	-	10,600 do. at 75 cts.	7,950 00
Common excavation	435	10,875 do. at 9 cts.	978 75
Removing detached rocks	-	-	150 00
1 culvert	-	-	300 00
Grubbing	-	-	400 00
			<hr/>
			28,991 25

Sixth Mile, (Crosses Watt's Branch—Mr. Scott's plantation.)

Common embankment	-	83	11,205 cubic yards, at 14 cts.	1,568 70
Do. excavation	-	1,677	25,155 do. at 8 cts.	2,012 40

Culvert at Watt's branch	-	-	-	-	2,000 00
2 bridges	-	-	-	-	350 00
Lock No. 3, lift 8 feet, at \$800 per foot	-	-	-	-	6,400 00
<i>Seventh Mile.</i>					<u>12,331 10</u>
Stone base under bank in river	-	900	6,300	cubic yards, at 50 cts.	3,150 00
Embanking	-	-	27,000	do. at 18 cts.	4,860 00
Paving the same	-	-	5,400	do. at 75 cts.	4,050 00
Embanking in river	-	233	5,359	do. at 18 cts.	964 62
Paving the same	-	-	1,398	do. at 75 cts.	1,048 50
Common embankment	-	30	1,500	do. at 11 cts.	165 00
Do. excavation	-	597	8,358	do. at 8 cts.	668 64
2 culverts	-	-	-	-	600 00
1 farm bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	200 00
Lock No. 4, lift 8 feet, at \$800 per foot	-	-	-	-	6,400 00
<i>Eighth Mile.</i>					<u>22,256 76</u>

Embanking in edge of river	-	233	4,660	cubic yards, at 10 cts.	466 00
Paving the same	-	-	1,631	do. at 90 cts.	1,467 90
Common excavation	-	1,527	22,905	do. at 8 cts.	1,832 40
1 culvert	-	-	-	-	300 00
1 bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	150 00
					<u>4,366 30</u>

SUBDIVISION No. 9—Continued.

1100 yds. remainder of the 9th subdivision.

	Distance, yds.	16,500 cubic yards, at 8 cts.	Dolls. cts.
Common excavation	-	-	1,320 00
1 bridge	-	-	150 00
Grubbing	-	-	300 00
Lock No. 5, lift 8 feet, at \$800 per foot	-	-	6,400 00
			<u>\$8,170 00</u>

REMARKS.

On the 2d mile below the mouth of Seneca creek, a low dam is calculated across the Potomac, at the head of the Seneca Falls : this will afford a spacious sheet of still-water from the site of the proposed dam, above the quarry where the Seneca stone is obtained, and will form the 4th spacious basin for the accommodation of Virginia ; and the supply of water, thus received into the canal, will prevent the necessity of taking the Seneca creek for a feeder, which is so valuable a mill stream ; and, therefore, is not included in this estimate.

AN ABSTRACT of the Estimates of the Ninth Subdivision.

Miles.	Feasible portions. Yds.	Culverts.	Bridges.	Lockage. Feet.	Cost per mile.
1	1,720	1	1	8	\$ 14,042 32
2	74	-	-	8	46,990 00
3	1,760	1	1	-	4,733 50
4	1,320	3	1	-	15,390 00
5	435	1	-	-	28,991 25
6	1,760	1	2	8	12,331 10
7	597	2	1	8	22,256 76
8	1,527	1	1	-	4,366 30
1,100 yds	1,100	-	1	8	8,170 00
8m1,100y	10,963 yds. or 6m. 403 yds.	10	8	40	\$ 157,271 17

For constructing 4 waste weirs, at \$200 each - 800 00
 Fencing on both sides, 6 miles 403 yards, at \$480 per m. 2,989 90

Cost of a canal of 40 feet surface, - - \$ 161,061 07

The feasible parts of the 9th sub-division on which the canal can be widened by common excavation, amount to 6 miles 403 yards ; on which the canal of 48 feet surface, with surf berms 2 feet wide on each side, and 5 feet depth of water, and locks 102 feet long, can be made for the following additional expense, viz :

For widening the excavation on 10,963 yards of the
 canal, at \$1 - - \$ 10,963 00
 lengthening culverts, 10, at \$55 each, - 550 00
 do. bridges, 8, at \$50 each, - 400 00
 do. lockage, 40 feet, at \$80, - 3,200 00

Amount of additions, - - 15,113 00
 To be added to the cost of the 40 feet canal, - 161,061 07

Cost of the canal of 48 feet surface, \$ 176,174 07

To increase the feasible parts of the 9th subdivision to a canal of 60 feet surface, &c. the following additional expense must be made to the cost of the 40 feet surface canal :

For widening the excavation on 10,963 yards distance, at \$1 50,	-	-	-	\$ 16,444 50
For lengthening culverts, 10, at \$94 each,	-	-	-	94000
do. bridges, 8, at \$150,	-	-	-	1,200 00
do. lockage, 40 feet, at \$80	-	-	-	3,200 00
				<hr/>
				21,784 50
Add the cost of the 40 feet surface canal,	-	-	-	161,061 07
				<hr/>
Total cost of the 60 feet surface canal,	-	-	-	\$ 182,845 57
				<hr/> <hr/>

From the head of the Great Falls to tide below the Little Falls.

First Mile, (passes Great Falls, and back of Bear Island.)

12

	Distance, yds.			Dolls. cts.
Rocky excavation,	-	-	12.321 cubic yards, at 25 cents,	3,080 25
Paving the same	-	-	do. at 75 cents,	1,248 75
Dam and guard-gate for feeder from head of Great Falls,	-	-	-	2,000 00
Side-dams to raise low places on the Island to turn the floods from the canal, &c.	-	-	-	2,000 00
Dam at the head of 4th lock	-	-	-	600 00
Battural walls and lining canal below 4th lock	-	-	-	4,710 00
Wall for towing path, from the 1st to 4th lock	-	-	-	1,111 00
Deep cut at leaving ravine of the river and entering the woods, back of Bear Island, part rocks,	325	10,725	do. at 50 cents,	5,362 50
Earth and wall tow-path	483	966	do. at 50 cents,	483 00
Grubbing	-	-	-	400 00
Locks No. 1, 2, 3, 4, 5, and 6, 48 feet, at \$800 per ft.	-	-	-	38,400 00
				<u>\$ 59,395 50</u>

SUBDIVISION No. 10.—Continued.

Second Mile, (passes back of Bear Island to the Potomac again.)

	Distance, yds.		Dolls. cts.
Making towing path, rock and earth in the rocky ravine	-	-	3,244 50
Stone basing for bank in river	721	6,489 cubic yards, at 50 cents,	7,869 00
Embanking in edge of river	366	do. at 50 cents,	5,416 80
Paving the same	-	do. at 20 cents,	1,921 50
Common excavation	-	do. at 75 cents,	969 12
1 farm bridge	673	do. at 9 cents,	150 00
Grubbing	-	-	500 00
Locks No. 7, 8, and 9, lift 24 feet, at \$800 per foot	-	-	19,200 00
			<hr/> \$ 9,270 92 <hr/>

Third Mile, (a great variety of ground.)

Stone basing in the river	-	1,104	11,040 cubic yards, at 60 cents,	6,624 00
Embanking in river	-	-	do. at 20 cents,	19,430 40
Paving the same	-	-	do. at 80 cents,	7,065 60
Rocky points to cut away	-	-	do. at 50 cents,	2,100 00
Common excavation	-	656	do. at 11 cents,	1,298 88
2 culverts	-	-	-	600 00
Grubbing	-	-	-	400 00
				<hr/> 37,518 88 <hr/>

Fourth Mile, (passing a stone-quarry and entering a ravine.)

Stone basing for a bank in the river	-	1,452	18,876 cubic yards,	at 50 cents,	9,438 00
Embanking the same	-	-	145,200	do.	29,040 00
Paving the same	-	-	14,520	do.	10,890 00
Common excavation	-	308	4,620	do.	462 00
Rock points to cut	-	-	800	do.	400 00
Lock No. 10, lift 8 feet at \$800 per foot	-	-	-	-	6,400 00
					<hr/>
					57,030 00
					<hr/>

Fifth Mile, (passes Turberville Falls.)

Stone base in the river	-	1,760	17,600 cubic yards,	at 50 cents,	8,800 00
Embanking the same	-	-	154,880	do.	30,976 00
Paving the same	-	-	14,080	do.	11,264 00
1 culvert	-	-	-	-	300 00
1 farm bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	200 00
					<hr/>
					51,690 00
					<hr/>

Sixth Mile, (leave river and run back of a ridge.)

Stone base in the river	-	450	2,250 cubic yards,	at 50 cents,	1,125 00
Embanking do.	-	-	13,500	do.	2,025 00
Paving do.	-	-	3,600	do.	2,700 00
Rocky points to cut	-	-	300	do.	150 00
Common excavation	-	1,310	30,150	do.	4,218 20
1 farm bridge	-	-	-	-	150 00
Grubbing	-	-	-	-	200 00
Lock No. 11, lift 8 feet, at \$800 per foot	-	-	-	-	6,400 00
					<hr/>
					16,968 20
					<hr/>

SUBDIVISION No. 10.—Continued.

Seventh Mile.

	Distance, yds.		Dolls. cts.
Common embankment	-	3,300 } 29,205 cub. yds. at 10 cts.	2,920 50
Do. excavation	-	28,905 }	
Paving 67 yards, a part of the above	1,727		
Racks to move	-	603 cubic yards, at \$1	603 00
3 Culverts	-	300 do. at 50 cents	150 00
1 Bridge	-	-	1,400 00
Grubbing	-	-	150 00
	-	-	100 00

\$5,323 50*Eighth Mile, (crosses Cabin John Creek.)*

Common embankment	-	2,400 cubic yards, at 11 cents	264 00
Do.	50	do. at 11 cents	830 16
Do.	288	do. at 10 cents	2,215 50
Paving 33 yards of the above	1,477	do. at 90 cents	297 00
Rocks to remove	-	do. at 40 cents	80 00
2 Culverts, (1 of 14, and 1 of 4 feet chord)	-	-	1,500 00
1 Farm bridge	-	-	150 00
Lock No. 12, lift 8 feet, at \$ 800 per foot	-	-	6,400 00

*Ninth Mile.*11,726 66

Common embankment and excavation	1,181	23,620 cubic yards, at 12½ cts.	2,952 50
Paving the above	-	do. at 80 cts.	7,558 40
Common excavation	579	do. at 9 cts.	729 54
1 Farm bridge	-	-	150 00

Grubbing	-	-	-	-	200 00
Lock No. 13, lift 8 feet, at \$800 per foot lift	-	-	-	-	6,400 00
<i>Tenth Mile, (passes head of Little Falls and United States' Arsenal.</i>					<u>17,990 44</u>
Common excavation to foot of lock N. 15	950	19,000 cubic yards, at 9 cents			1,710 00
Lock No. 14, lift 8 feet } to the head of the old					
Lock No. 15, lift 6 feet } Canal.					
Lockage 14 feet at \$800 per foot	-	-	-	-	11,200 00
Here join the old canal, and widen the same to the size of the new.					
For widening and enlarging the old canal	810	10,530 cubic yards, at 10 cents			1,053 00
Guard lock, 8 feet lift, at \$800 per foot	-	-	-	-	6,400 00
<i>Eleventh Mile, (passes Powder Mill and Road to Chain Bridge and Granite Quarry.)</i>					<u>20,563 00</u>
For enlarging the old canal to the bridge	1,366	17,758 cubic yards, at 10 cents			1,775 80
For enlarging the canal below the bridge, by moving the present bank and saving road	394	do. at 10 cents			788 00
1 Road bridge	-	-	-	-	200 00
<i>933 Yards, to head of old locks, and end of 10th Subdivision.</i>					<u>2,763 80</u>
Moving the canal bank	-	-	-	-	1,866 00
1 Farm bridge	-	-	-	-	150 00
Subdivision 10 ends at head of locks.					<u>2,016 00</u>

REMARKS.

Near the commencement of the 10th subdivision, a feeder is calculated to be taken from the Potomac by a short wing dam, near the head of the Great Falls.

In the 10th mile of this subdivision, the canal is so located as to lock down to the level of the present canal, by a lock of 6 feet lift. A supply of water can here be admitted from the Potomac at the head of the Little Falls, through the present canal; not only for the purposes of navigation, but for mill sites and other hydraulic purposes, to a great extent, as the fall from the head of the Little Falls to Georgetown is computed at 37 feet.

AN ABSTRACT of the Estimates of the 10th Subdivision.

Miles.	Feasible parts to be widened and fenced.	Culverts.	Bridges.	Lockage. Feet.	Cost per Mile.
1	-	-	-	48	\$59,395 50
2	673	-	1	24	39,270 92
3	656	2	-	-	37,518 88
4	308	-	-	8	57,030 00
5	-	1	1	-	51,690 00
6	1,310	-	1	8	16,968 20
7	1,727	3	1	-	5,323 50
8	1,477	2	1	8	11,726 66
9	579	-	1	8	17,990 40
10	1,760	-	-	14 & 1 g.l.	20,363 00
11	1,760	-	1	-	2,763 80
933 yds.	933	-	1	-	2,016 00
11 miles 933 yards	11,183 yards or 6 m. 623 y.	8	8	118 Feet	\$322,056 86

Add to the above 5 waste weirs, at \$200 each - 1,000 00
 6 miles 623 yards to fence, at \$480 - 3,049 90

Total cost of a 40 feet canal for the 10th Subdivision \$326,106 76

Of the 10th Subdivision, 6 miles and 623 yards are feasible ground, on which a Canal of 48 feet surface, &c. and locks 102 feet long, may be made at the following additional expense:

For widening the canal on 11,183 yards, at \$ 1	-	\$ 11,183 00
For lengthening culverts, 8, at \$ 55 each	-	440 00
For do. bridges, 8, at \$ 50 each	-	400 00
For do. lockage, 118 feet, at \$ 80 per foot		9,440 00

Amount	\$ 21,463 00
Add the cost of the 40 feet canal	326,106 76

Cost of the 48 feet canal	<u>\$ 347,569 76</u>
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To make the feasible parts of the 10th Subdivision, which are 6 miles and 623 yards, into a canal of 60 feet surface, &c. the following additions are necessary, viz :

Increasing the width on 11,183 cubic yards, at \$ 1 50	\$ 16,774 50
Do. the length of 8 culverts, at \$ 94 each	752 00
Do. do. of 8 bridges, at \$ 150 each	1,200 00
Do. do. of 118 feet of lockage, at \$ 80	9,440 00

Add this amount	\$ 28,166 50
To the cost of the 40 feet canal	326,106 76

Cost of the 60 feet canal	<u>\$ 354,273 26</u>
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SUBDIVISION No. 11.

*From the Little Falls to the city line of Georgetown.**First Mile, (from the head of the locks.)*

	Distance, yds.		Dolls. cts.
Common excavation	-	35,200 cubic yards, at 9 cents	3,168 00
1 Culvert	-	-	300 00
2 Farm bridges	-	-	350 00
Moving the road, 633 yards	-	6,330 cubic yards, at 8 cents	506 40
			<hr/>
			\$4,324 40

Second Mile + 278 yards, to the city line of Georgetown.

Common embankment	-	66	27,657 cubic yards, at 14 cents.	3,871 98
Rock cutting	-	423	do. at 50 cents	4,230 00
Common excavation	-	1,552	do. at 10 cents	31,040 00
Paving the same	-	-	do. at 75 cents	5,820 00
1 Culvert	-	-	-	300 00
Moving the road, 2,038 yards	-	-	-	11,000 00
Lockage, 37 feet, at \$ 800 per foot lift	-	-	-	29,600 00
				<hr/>
				85,861 98

AN ABSTRACT of the Estimates of the 11th Subdivision.

Distance.	Feasible Portion.	Culverts.	Bridges.	Lockage. Feet.	Cost per Mile.
1	1,760	1	2	-	\$ 4,324 40
1 m. 278 yds.	2,038	1	-	37	85,861 98
		2	2	37	\$ 90,186 38
One waste weir	-	-	-	-	200 00
Fencing 2 miles and 278 yards, at \$ 480 per mile	-	-	-	-	1,035 81
					<u>\$ 91,422 19</u>

Of the 11th Subdivision, 1,127 yards can be widened to a 48 feet canal, &c. for the following additional expense, viz :

For widening the excavation, 1,127 yards, at \$ 1	-	\$ 1,127 00
For lengthening 2 culverts, at \$ 55 each	-	110 00
For do. 2 bridges, at \$ 50 each	-	100 00
For do. 37 feet of lockage, at \$ 80	-	2,960 00
To this amount	-	\$ 4,297 00
Add the cost of the 40 feet canal	-	91,422 19
Cost of the 48 feet canal	-	<u>\$ 95,719 19</u>

The feasible parts of the 11th Subdivision made into a 60 feet canal, will require the following additions, added to the 40 feet canal :

On excavation 1,127 yards, at \$ 1 50	-	\$ 1,690 50
On culverts, 2, at \$ 94 each	-	188 00
On bridges, 2, at \$ 150 each	-	300 00
On lockage, 37 feet, at \$ 80 per foot	-	2,960 00
		<u>\$ 5,138 50</u>
Add the cost of the 40 feet canal	-	91,422 19
Cost of the 60 feet canal	-	<u>\$ 96,560 69</u>

GENERAL ABSTRACT of the Estimates of the Eastern Section of the Chesapeake and Ohio Canal.

Section.	Miles.	Yards.	Feasible.	Difficult.	Culverts.	Aqueducts.	Bridges.	Locks.	Waste Weirs.	Dams & Feeders.	40 Feet Canal. Cost.	48 Feet Canal. Cost.	60 Feet Canal. Cost.
1	16	1692	8	1635	26	1	4	96	7	1	\$320,438 65	\$345,643 65	\$355,559 06
2	36	533	23	193	40	2	15	112	18	1	826,315 92	879,898 92	903,795 42
3	17	455	14	1109	26	1	18	32	5	-	250,759 07	281,843 07	296,992 57
4	16	1529	5	1020	22	1	19	40	5	-	422,024 77	436,764 77	444,120 77
5	30	257	21	1372	19	1	23	56	12	1	647,654 58	692,661 58	714,868 58
6	9	1099	6	1095	6	1	9	56	4	1	204,492 42	222,267 42	229,028 92
7	17	1146	14	416	29	-	23	24	5	-	201,758 99	231,209 99	246,912 99
8	19	1131	18	106	30	1	21	24	6	-	191,606 75	228,912 75	247,175 75
9	8	1100	6	403	10	1	8	40	4	1	161,061 07	176,174 07	182,845 57
10	11	933	6	623	8	-	8	118	5	2	326,106 76	347,569 76	354,273 26
11	2	278	-	1127	2	-	2	37	1	-	91,422 19	95,719 19	96,560 69
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186		1553	126	299	218	9	160	635	72	-	\$3,643,641 17	\$3,937,265 17	\$4,072,133 58
Add 10 per centum for contingencies and superintendence												364,364 11	407,213 55
Miles 186. 1353 yards, or 186½ miles. Total cost												\$4,330,991 68	\$4,479,346 93
Average cost of each mile												\$23,191 38	\$23,985 79

In these estimates, it will be observed that a variation is made in the plan of the aqueducts at Great Conococheague, Monocacy, Antietam, and Seneca creeks.

The reasons for such variation were the great difficulty and expense to be increased in keeping up a level, for several miles, in order to obtain an elevation sufficiently high to turn stone arches, and give sufficient height and breadth to vent the floods safely under them.

The calculations are made for aqueducts similar in construction to those over the Mohawk river, below Schenectady, on the Erie canal, those being similarly situated, but of much greater length than any required on this proposed canal. It may be proper further to observe, that, in the estimates of masonry, it was considered that water-lime would be found in the vicinity of this canal, as it crosses the same great limestone valley in which it abounds, of good quality, in Pennsylvania, as well as in all the limestone districts of New York; and that, by means of the navigation of the Potomac, lime and other materials could be delivered on any part of the line of this canal at reasonable prices. In these estimates lock masonry is computed at five dollars, and well hammered masonry, for culverts, aqueducts, piers, &c. at three dollars a perch, of twenty-five cubic feet.

With reference to the seven great feeders embraced in these estimates, it is proper to observe, that they are all, except the Great Conococheague, from the Potomac itself, from which as great a quantity of water may be drawn as can conveniently move in the canal, without obstructing the ascending navigation.

The distance to be supplied by each of those feeders is as follows: Beginning at subdivision No. 1, which is to be supplied by a feeder from the Potomac and Mills Creek, on the Middle section, to

		Miles.	Feet.	Descent.	Feet.
	The S. Branch of the Potomac	16	4,076	104	13
Feeder No. 1.	From Potomac, below S. Branch	31		96	12
No. 2.	From Potomac, to supply the end of the 4th subdivision, (Williamsport)	39	2,271	80	10
No. 3.	From Great Conococheague to Harper's Ferry	38	4,068	112	14
No. 4.	From the Potomac, below Shenandoah, to supply to the head of Seneca Falls	39	1,551	64	8
No. 5.	From the Potomac, at Seneca Falls, to the head of the Great Falls	7	3,300	32	4
No. 6.	From Potomac, at the head of the Great Falls, to the head of the Little Falls	9	2,799	110	14
No. 7.	From the head of the Little Falls (through the present canal) to Georgetown	4	834	37	5
Total		186	4,059	635	80

Of feeders, it may be proper to observe, that, although the water of Lake Erie is the chief supply for a distance of one hundred and sixty miles, to the Cayuga marshes, yet, on the same canal, the feeder from the Mohawk river, at the Little Falls, proved insufficient to support that navigation for twenty miles, and a dam and feeder, to bring a new supply from the Mohawk river, were found necessary.

At the proposed dam above the mouth of the Great Cacapon, the distance to Conococheague, where the next supply is calculated to be taken, being over thirty-one miles, a scarcity of water may be experienced. In that event, Licking creek, though not a copious stream in dry seasons, would doubtless be found an adequate auxiliary. The distance of Licking creek above Conococheague is seventeen miles nearly—a suitable place to receive aid on the said distance, should it be found wanting.

Doubts have been entertained whether the Conococheague would not, in dry times, be insufficient to supply the canal to Harper's Ferry, where the next feeder is calculated to enter—almost thirty-nine miles. In the eighth mile below Williamsport, the river measures but five hundred feet in width, and its surface is but eighteen and a half feet below the canal surface as the line is located at that place. A plan of feeding the canal, entirely new, may be here suggested, to wit: dispensing altogether with the Conococheague for a feeder.

Instead of the three eight-foot locks, planned in this distance, let there be four seven-foot locks, which would let the canal surface to within fourteen and a half feet of the river surface; then, by a dam of said height, throw the Potomac into the canal through a guard-lock. The whole river would be thus at command for a feeder.

The slack water navigation in the Potomac would extend up past Williamsport, and an entrance into the canal from the Virginia shore effected.

If the cost of said dam, locks, &c. should equal the estimated cost of the Conococheague feeder, still much would be gained by leaving undisturbed the rights of the mill owners—of great value not only to the proprietors, but to the community.

From Harper's Ferry to Seneca Falls, where the next feeder enters, is over thirty-nine miles; and, should all the water that could be made to enter the canal above prove insufficient for said distance, enough could be taken, through short feeders, from Catoctin, Tuscarora, and Little Monocacy creeks, without disturbing mill owners.

All which is very respectfully submitted.

JAMES GEDDES,

Civil Engineer.

NATHAN S. ROBERTS,

Civil Engineer.

CHESAPEAKE AND OHIO CANAL COMPANY.

MEMORIAL

OF THE

CENTRAL COMMITTEE

OF THE

CHESAPEAKE AND OHIO CANAL CONVENTION

TO THE

CONGRESS OF THE UNITED STATES.

JANUARY 28, 1828.

Read, and referred to the Committee of the Whole House to which is committed the
“bill to explain an act, entitled ‘An act confirming an act of the Legislature of Virginia, incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland for the same purpose.’”

WASHINGTON :

PRINTED BY GALES & SEATON.

1828.



MEMORIAL.

To the Senate and House of Representatives of the United States in Congress assembled:

The memorial of the Central Committee of the Chesapeake and Ohio Canal Convention, which first assembled in the City of Washington, on the 8th November, 1823, and re-assembled therein, on the 6th of December, 1826,

MOST RESPECTFULLY REPRESENTS :

That, as the important work confided, by a resolution of the Convention, to the supervision and care of the memorialists, proceeds towards its final consummation, a defect has been manifested in the charter of the company, by the recent discovery of the legal construction, by the Legislature of Virginia, of that clause thereof which prescribes that the "*estates, rights, and interests of the company*," and, consequently, the shares of stock therein, "*shall be adjudged and taken, in law, to be real estate*."

This clause, in the charter of the present Potomac Company, doubtless gave rise to the 6th section of an act of a prior General Assembly of Virginia, entitled "An act to amend an act, entitled 'An act for opening and extending the navigation of Potomac river,'" which passed the 16th of December, 1790, and may be found in the 13th volume of the Statutes at large of that State, where it first met the eye of your memorialists. Not having appeared among any of the compilations of the numerous acts constituting the charter of the Potomac Company, it had passed unregarded, in the act of the General Assembly of Virginia, of the 22d of February, 1822; which was adopted by the Chesapeake and Ohio Canal Convention, as the basis of the charter that they solicited; nor was it, afterwards, comprehended in the charter itself.

The 6th section of the act referred to, by your memorialists, declares, "that it shall and may be lawful for persons not citizens of this Commonwealth (meaning the Commonwealth of Virginia) to purchase and hold the non-subscribed shares of the said Potomac Company: *Provided*, That the persons so purchasing shall not, thereby, become citizens of this Commonwealth."

Subsequently to the date of the act of which this section is a part, considerable sums were subscribed, by aliens, to the stock of the Potomac Company. Being still held by them, this stock is included in the shares of the stock of that company, which, by the late charter, were designed to make, with the consent of the holders, a part of the stock of the new company.



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Accordingly, on the books of subscription, now open, in the town of Alexandria, stock to the amount of \$ 23,555, has been subscribed, or transferred from the old to the new company, on foreign account.

To render such subscriptions valid, in conformity with the intent of the new charter, it appears, therefore, essential, that this charter be amended.

But, since the attention of your memorialists has been thus forcibly attracted to this, till now, latent defect of the charter of the Chesapeake and Ohio Canal Company, it has been deemed by them highly expedient, if not indispensably necessary, to extend the proposed amendment, so far as to provide, with the approbation of the Company, and of the necessary parties to their charter, that these shares of stock shall be adjudged and taken, in law, to be personal, and not real estate.

Personal estate is governed by the *lex loci* of the decedent, in its distribution on the death of the owner. Real estate, in its descent, or transfer by purchase, by the law of the country in which it lies.

But the charter of the Chesapeake and Ohio Canal Company, like that of the Potomac Company, being the offspring of the concurrent acts of different Legislatures, who have attached peculiar qualities to such real estate as lies within their respective jurisdictions; inasmuch as the certificates of the stock of a joint company have not, in their nature, the locality of real property, it may be easily foreseen, or imagined, how much perplexity would arise in the attempt to determine, any where within or without the United States, what rule of descent or distribution would attach to it, on the demise of its holder. Shall it be regarded, as real estate in Pennsylvania, in Maryland, in Virginia, or on either shore of the Potomac, within the District of Columbia? In cases of intestacy, occurring abroad, of the foreign holder, by what law of descents shall such real estate be cast upon the heir? By that of the native or adopted country of the decedent, or of one of the many parties to the charter, which declares this property to be, in law, real estate? A like difficulty would occur, in regard to the disposition of the stock of a decedent citizen of any other of the United States, in fine, of any of the States who are parties to the charter.

Although the 17th section of the new charter provides a rule of evidence for the ordinary transfers of the shares of this stock, it supplies none, whatever, for such as are made by devise, or bequest: the proof necessary to the validity of which, varies in the States which have been named, and even between the opposite shores of the Potomac river, within the District of Columbia.

The 6th section of the act of the General Assembly of Virginia, which passed in 1790, applies, moreover, to the then *non-subscribed* stock of the Potomac Company, and would probably have been fruitful of litigation, had not the whole capital stock of the company so declined in value, as almost to disappear from the money market, as a subject of speculation or purchase.

Your memorialists do not deem it necessary to proceed farther in this inquiry, or to extend it to an investigation of the policy of making a species of *personal property real estate*, and less fitted for the purposes of commercial exchange, regarded either with or without the qualification of the Virginia act of 1790, in order to satisfy your honorable body of the expediency of making the stock of the Chesapeake and Ohio Canal Company, like that of other incorporated companies, every where else, *personal estate*.

They respectfully but urgently request, therefore, that you will grant the proposed amendment of the charter of the Chesapeake and Ohio Canal Company, resting its validity on the assent of the other parties thereto, and the approbation of the stockholders, to be expressed in general meeting.

Your memorialists would have left it to the company to make this request, had they not deemed the saving of a single year, in the prosecution of a public enterprise of such inestimable value, an object of sufficient consequence to apologize for this memorial, if, indeed, the new company could avail themselves of a surrender of the rights of the old, without this amendment; which they solicit, therefore, for their mutual benefit.

Since the order of the committee that this memorial should be presented to your honorable body, an act, in pursuance of the prayer which it contains, has received the sanction of the State of Maryland, as an authenticated copy thereof testifies. In confirming another amendment of the same charter, by the Legislature of Virginia, formerly communicated, but not acted upon by Congress, it affords an occasion for giving the sanction of the National Legislature to both.

Signed by order :

C. F. MERCER,

*Chairman of Central Committee of Chesapeake
and Ohio Canal Company.*

EXECUTIVE DEPARTMENT,

Richmond, February 7th, 1826.

SIR : In compliance with a Resolution of the General Assembly of this State, I have the honor to transmit, herewith, an authenticated copy of an act passed at the present session of the General Assembly, amending the act incorporating the Chesapeake and Ohio Canal Company, with a request that you will submit the same to the House of Representatives of the United States.

I have the honor to be,

Your most ob't servant,

JOHN TYLER.

The Honorable SPEAKER

Of the House of Representatives of the United States.

VIRGINIA, to wit :

I, John Tyler, Governor or Chief Magistrate of the State aforesaid, do hereby certify, and make known unto all whom it may concern, that George W. Mumford, whose name is subscribed to the annexed document, is Keeper of the Rolls of Virginia, duly appointed and qualified according to law, and to all his official acts, as such, full faith, credit, and authority, are had and ought to be given.

In testimony whereof, I have subscribed my name and caused the great seal of the State to be affixed hereunto.

Done at the City of Richmond, the sixth day of February, in
[L. s.] the year of our Lord one thousand eight hundred and twenty-six, and of the Commonwealth the fiftieth.

JOHN TYLER.

An act to amend the act, entitled " An act incorporating the Chesapeake and Ohio Canal Company," passed the 26th of January, 1826.

Whereas it appears to this General Assembly, that, in the proviso to the fifth section of the act entitled " An act incorporating the Chesapeake and Ohio Canal Company," passed the 27th day of January, 1824, the following words, destructive of the intent and operation of the said section, have been inserted, to wit : " nor any payment demanded within any year, from the commencement of the work :"

Be it therefore enacted, by the General Assembly of Virginia,, That so soon as the Legislatures of Maryland and Pennsylvania, and the Congress of the United States, as the Legislature of the District of Columbia, shall assent to this act, the words above quoted shall be repealed and expunged from the aforesaid proviso ; and thenceforth the said proviso shall be construed in the same manner, and have the same effect as if the afore-recited words had never been inserted therein.

I hereby certify that the foregoing is a true copy of an act passed during the present session of the Legislature of Virginia.

Given under my hand, (there being no seal of office,) this 30th day of January, 1826.

GEORGE W. MUMFORD,
Keeper of the Rolls for the State of Virginia.

An act further to amend the act incorporating the Chesapeake and Ohio Canal Company.

Whereas it is represented to this General Assembly, that it may tend greatly to the promotion of the object of the original act incorporating the Chesapeake and Ohio Canal Company, to authorize a subscription for its stock by aliens ; and doubts have arisen whether,

under said act, such stock may be held by others than citizens of the United States, and whether the stock of said Company is to be regarded as real or personal property :

SEC. 1. *Be it enacted by the General Assembly of Maryland,* That it shall and may be lawful for the Commissioners, for the time being, and for the President and Directors of said Company, whensoever the same shall be duly organized, agreeably to the provisions of the original act aforesaid, to receive subscriptions for any number of shares of the capital stock of said Company, from any alien or aliens, who are hereby declared competent to hold the same ; and, if in their judgment it be necessary, to appoint an agent, or agents, to visit Europe for that purpose.

SEC. 2. *And be it enacted,* That the shares of the capital stock of said Chesapeake and Ohio Canal Company shall be deemed and taken to be personal estate, and, as such, to be liable to be assigned and transferred : *Provided,* That it shall not be lawful for any stockholder in said Company to assign any share or shares, by him or her held, unless it be in person, or by attorney, upon the books of said Company : *And provided, also,* That no transfer or assignment shall be made, except for one or more whole share or shares, and not for any part of such share or shares ; and that no share or shares shall, at any time, be assigned or transferred, or held in trust for the use and benefit, or in the name of another, whereby the said President and Directors, or Stockholders, of the said Company, or any of them, shall or may be challenged, or made to answer concerning any such trust : but that every person, appearing, as aforesaid, to be a stockholder, shall, as to others of the said Company, be, to every intent, taken absolutely as such ; but, as between any trustee and the person for whose benefit any trust shall be created, the common remedy may be pursued.

SEC. 3. *And be it enacted,* That the words "nor any payment demanded within any year from the commencement of the work," inserted in the proviso to the fifth section of the original act incorporating the Chesapeake and Ohio Canal Company, passed the twenty-seventh day of January, eighteen hundred and twenty-four, by the General Assembly of Virginia, and subsequently confirmed by the General Assembly of Maryland, be, and the same are hereby, repealed, and expunged from the aforesaid proviso ; and henceforth the said proviso shall be construed in the same manner, and have the same effect, as if the afore-recited words had never been inserted therein. -

SEC. 4. *And be it enacted,* That this act shall commence and be in force as soon as it shall have received the assent of the Legislature of Virginia, of the Congress of the United States, of the Potomac Company, and of the Stockholders of said Chesapeake and Ohio Canal Company, to be given at their first general meeting after the passage of this act.

We hereby certify the foregoing act is a true copy of the original, which passed both branches of the Legislature of Maryland at their December session, eighteen hundred and twenty-seven.

Given under our hands, at the City of Annapolis, this 25th day of January, 1828.

W. KILTY,

Clerk of the Senate of Maryland.

GIDEON PEARCE,

Clerk of the House of Delegates of Maryland.

CHESAPEAKE AND OHIO CANAL.

JANUARY 2, 1828.

MR. MERCER, from the Committee on Roads and Canals, made the following

REPORT:

The Committee on Roads and Canals, to whom was referred the memorial of the Central Committee of the Chesapeake and Ohio Canal Convention, and of the Commissioners appointed by the States of Virginia and Maryland, and by the United States, to open books for the subscription of stock to the said Canal, report:

They are apprized, that, since the last adjournment of Congress, books have been opened for the subscription of stock in the Chesapeake and Ohio Canal Company, upon which are already subscribed, by the Corporation of the City of Washington, one million of dollars; by the Corporation of Georgetown, two hundred and fifty thousand dollars; and by individuals within the District of Columbia, and in other portions of the United States, about six hundred thousand dollars, on the terms required by the charter of the Company, making, together, the sum of about one million eight hundred and fifty thousand dollars; and, that the Legislature of the State of Maryland, and the Corporation of the town of Alexandria, within the District of Columbia, have authorized, upon certain conditions, a subscription of the sum of seven hundred and fifty thousand dollars; five hundred thousand dollars thereof by the State of Maryland, being dependent upon three conditions, which will be found in the twenty-first section of an act of the Legislature of that State for the promotion of Internal Improvement, which passed the 8th of March, 1826; and an act of the Legislature of that State, modifying the former act, which passed at its last session.

The first of these conditions, if not already supplied, will be fulfilled by the first of the two bills which accompany this report; and which is, in tenor, the same with that reported for the same object, by the Committee on Roads and Canals, at the Second Session of the 19th Congress; the second depended on the practicability, now ascertained by actual survey, of connecting the Chesapeake and Ohio Canal "with the Patapsco river, at the city of Baltimore;" and the third, on a subscription, by the United States, of one million of dollars to the stock of the Chesapeake and Ohio Canal; which is the object of the second bill accompanying this report.

In giving effect to this last condition, in the mode recommended by the Committee, should it receive the sanction of Congress, the only condition required to give validity to the subscription of the Corporation of the town of Alexandria, will, also, be supplied; so, that a subscription of one million of dollars, by the United States, will enlarge the stock of the Chesapeake and Ohio Canal, by an addition thereto of seventeen hundred and fifty thousand dollars; and extend the whole amount thereof to about three million six hundred thousand dollars, without computing any farther subscriptions from any other source.

The Committee are apprized that, with this sum, and such further aid as the subscription of a million of dollars to the stock of the Canal by the United States would enable the Chesapeake and Ohio Canal Company to obtain, whenever necessary, the friends of this enterprise confidently expect to be able to complete the eastern section of the canal, as far as the Coal Banks, on which reliance is had to secure the ultimate accomplishment of their entire work to Pittsburg.

By the third section of the charter of the Chesapeake and Ohio Canal Company, the subscribers are now incorporated; but a public meeting for the organization of the Company, by the election of its officers, has been delayed till the first Monday of April, in the hope that effect would be given, by that period, to the subscription of the State of Maryland and the Corporation of Alexandria, by the subscription invited from the Government of the United States; and in order that the election of the officers of the Company should be the result of a joint meeting of all its stockholders, to the extent, in interest, of a sum largely exceeding, in amount, three millions and a half of dollars.

As the grounds, on which the memorialists invite the co-operation of Congress, are supplied, in part, by their memorial, and the report of the Committee on Roads and Canals, in relation thereto, at the last session of Congress, certain portions of that memorial and report are made, by your Committee, a part of this report.

Your Committee are apprized that a communication may shortly be expected from two practical Engineers, from the State of New York, of established reputation, calculated to determine, upon the basis of long tried experience, the probable cost of the Chesapeake and Ohio Canal. The Committee would have awaited the completion of their report, had not other sources of intelligence, of equivalent authority, confirmed their confidence in the reduced estimate of the cost of this work, formed by the Committee on Roads and Canals, at the last session of Congress; and was it not certain that the expected communication from Messrs. Geddes and Roberts will reach the House of Representatives before the last of the two bills which accompany this report can be finally acted upon.

MEMORIAL

Of the Central Committee of the Chesapeake and Ohio Canal Convention, and of the Commissioners appointed by the States of Virginia and Maryland, and by the United States, to open books for subscription of stock to the said Canal.

To the Senate and House of Representatives of the United States in Congress assembled:

The memorial of the Central Committee of the Chesapeake and Ohio Canal Convention, and of the Commissioners appointed by the States of Virginia and Maryland, and by the United States, to open books for the subscription of stock to the said Chesapeake and Ohio Canal,

RESPECTFULLY REPRESENTS :

That numerous assemblies of citizens of the States of Ohio, Pennsylvania, Maryland, and Virginia, and of the District of Columbia, deeply interested in the improvement of the navigation of the waters of the Ohio and Potomac rivers, and their connexion by a continued canal, deputed Delegates to a Convention in the city of Washington, empowered to digest and to promote the adoption of the best means of accomplishing the above object.

This Convention met in the Capitol of the United States, on the 6th day of November, 1823, and agreed upon the resolutions contained in the annexed Journal of their Proceedings. Pursuant to one of those resolutions, a supervising Central Committee was appointed to correspond with, and to harmonize the views of the dispersed friends of the common enterprise, and to recommend to the Legislatures of the States of Ohio, Pennsylvania, Maryland, and Virginia, and of the United States, the exclusive sovereign of the District of Columbia, a combined system, conformable to the views of the Convention.

After much ineffectual legislation, and consequent delay, the States of Virginia and Maryland at length concurred in chartering a Joint Stock Company, with authority to extend a canal from the tide of the Potomac, to the navigable waters of the Ohio, under certain conditions set forth in their acts of incorporation. Among those conditions, it is provided, that the proposed canal shall consist of two sections; the eastern, to commence within the District of Columbia, and passing up the valley of the Potomac, to terminate amidst the coal banks, at the base of the Alleghany; the other, or western section, after crossing that mountain, to reach a point on the western waters, already accessible by the steamboats of the Ohio: That the eastern section shall be first executed, and the authority to begin and finish it be deemed complete, on receiving the sanction of the Congress of the United States, and the assent of the existing Potomac Company, in whom the States of Maryland and Virginia had, by acts anterior to the ratification of the Federal Constitution, vested all their rights to

improve the river Potomac and its tributary streams, for the purposes of navigation.—That the authority to complete the western section should await the concurrent assent of the Legislature of Pennsylvania, and the subscription of funds adequate to the accomplishment of the entire work.

The sanction required of the United States, was conferred by an act of the last Congress, approved by the President, on the third day of March, 1825.

The Potomac Company complied with the terms of the new charter, by their resolutions of the 16th day of May, 1825 ; a copy of which, with the preceding acts, is annexed to this memorial, together with such abstracts from the charter of the Old Company, and the proceedings thereof, as manifest the extent and value of the rights which they have conditionally surrendered.

By these several acts and resolutions, a complete authority is provided for any company which they may create, to begin and complete the eastern section of the Chesapeake and Ohio Canal.

On the 7th day of February, 1826, the Legislature of Pennsylvania, by an act, of which a copy is hereto subjoined, gave their conditional assent to the common charter.

An inadvertent mistake, believed to be within the reach of judicial correction, having its origin, it is supposed, in a hasty transcription or engrossment of the original act of Virginia, the basis of the new charter, the Legislature of that State have deemed it expedient to correct, by an explanatory act hereto subjoined.

In the execution of these several acts, the President, during the past Summer, appointed three commissioners, in behalf of the United States ; and, at subsequent periods, the Executives of Maryland and Virginia severally deputed, each, three commissioners, on behalf of their respective States, to co-operate jointly in obtaining subscriptions of stock to the canal, so authorized to be constructed.

The late President of the United States, in his Message, at the opening of the first Session of the Eighteenth Congress, adverting to the recent Convention in Washington, earnestly recommended the object of your memorialists ; and, in order to place beyond doubt its practicability, advised that a survey should be made of the "*unexplored ground*," over which the proposed canal was to be conducted. The commissioners, apprized by the report of this survey, from the United States' Board of Internal Improvement to the last Congress, that a further report would be made to the present, have delayed the performance of the duty charged upon them, until the estimates expected to accompany that report, should be completed.

In the interim of this unavoidable, though regretted, delay, by a legislative act of the 8th March, 1826, the 19th, 20th, 21st sections of which are hereto annexed, the State of Maryland has authorized, upon certain conditions, subscriptions of half a million of dollars to the stock, which may be required for the completion of the eastern section of the contemplated canal.

To these conditions, and especially to that which renders the validity of the subscription of Maryland dependent on the co-operation of the Government of the United States, in subscribing to the same stock, your memorialists beg leave to solicit your attention. They confidently believe that upon that co-operation the success of their whole enterprise must ultimately rest.

In asking as early an attention, as may be consistent with the public interest, to this object of their memorial, your memorialists do not desire to anticipate the expected estimates of the United States' Board of Engineers. by a pledge of any part of the public revenue, to the accomplishment of a work which should not, they are aware, be undertaken without due consideration, nor begun, without adequate resources. They seek to obviate, as far as is within their power, the consequences of a yet farther delay of those estimates, by placing before you their memorial, with the acts of the several States, in behalf of whose citizens they address you.

Your memorialists do not presume to prescribe to your better judgment, the extent, or the conditions, of any subscription, which the interests of the Union and your wisdom may sanction. They solicit an ample investigation of all the grounds, on which they rest their appeal to the policy of an enlightened, and to the zeal of a patriotic Legislature. They commit to you the fate of an enterprise, the practicability of which, has already been placed beyond the possibility of doubt; the accomplishment of which is obviously within your power; and which, if accomplished, cannot but redound to the honor of the age, and to the prosperity of the country which shall give it birth, and conduct it to maturity.

If they may be allowed to enlarge on so fruitful a topic, in the short compass of a memorial, already, perhaps, too extended, they invite you to exercise the authority of a proprietor of the public property in this city, and of that which covers so large a region of the West, and to compute the almost incalculable value which the fulfilment of their purposes must add to the national domain.

As the Legislature of a District and People, whose hopes of future prosperity are wrapt up in this measure, and who have no other political guardian than yourselves, they ask of you the exercise of the provident care of an irresponsible, but paternal sovereign.

As the Federal Depository of the common safety from foreign danger, they appeal to your foresight, to profit by the past, and to provide, amidst the prosperity of peace, for the exigencies of future wars: to accumulate, in an imperishable form, treasure, to defray its cost when such calamity shall unfortunately come, and to assure, by the same means, the prompt concentration, and speedy direction, of the resources of the Union, for the defence and security of its members.

As the efficient spring of the diffusion of commercial, social, and political intelligence, over a widely extended territory, they ask you to facilitate the intercourse of its People, who, though divided by many chains of mountains, have a constitutional right to regard each other as fellow-citizens, friends, and brothers.

As the only medium of negotiation among the several States of this Union, your memorialists ask the General Government to secure to those States the practical benefit of a commercial intercourse with each other, and an open and easy access to the markets of the world. In regulating the trade of the Eastern and Western portions of this Union, by virtue of your acknowledged authority—to afford to both, the readiest exchange of their respective superfluities, and to extend to labor and industry, by thus augmenting the value of their fruits, their appropriate and just reward.

As the equal guardian of the rights of all classes of society, may your memorialists not ask you to restore to agriculture, by cheapening the carriage of its heavy products, that surplus revenue, which has been avowedly created for the benefit of manufactures, and thus to enable internal trade to heal the dissensions of those jarring interests, by the interchange of reciprocal benefits?

Combining with multiplied powers of taxation, facilities of borrowing, enhanced by the superior credit of a common Government, may not your memorialists appeal both to economy and justice, to reduce the cost of those public works, which, designed for the welfare of all the States, have a claim for their execution on the common wealth? If any such work be the joint offspring of public and private contributions, and be also calculated greatly to increase the annual exports of the United States, in prescribing, by the most contracted policy, limits to its cost, the revenue resulting from the consequent augmentation of foreign imports, should be computed along with the sum of its tolls: and, if the relative interest become the measure of the relative subscription of the Government, as a stockholder, to that of all other subscribers to the same work, this proportion cannot be computed at less than the actual ratio of the aggregate of both sums to that cost.

Finally, regarding you as the political bond of a common Union, your memorialists implore you to perpetuate its duration, by multiplying, in the simplest form, its most substantial blessings.

The following are the names of the Delegates composing the Chesapeake and Ohio Canal Convention, which met in the Capitol at Washington, Nov. 6, 1823.

FROM THE STATE OF OHIO.

Belmont County.

Benjamin Ruggles,

Stephen Caldwell.

Jefferson County.

John C. Wright.

FROM THE STATE OF PENNSYLVANIA.

Fayette County.

Albert Gallatin,

James Shriver.

FROM THE STATE OF VIRGINIA.

Frederick County.

A. H. Powell,
William B. Page,
James M. Mason,
H. St. G. Tucker,

John Mackey,
William Barton,
Nathaniel Burwell.

Prince William County.

John Gibson,
John M. Crea,
William Hebb,

John Hooe,
Redman Foster,
Walter Harrison.

Fairfax County.

William H. Fitzhugh,
R. T. Thompson,
John Moore,

William Moss,
John C. Hunter,
Thomas Moss.

Shenandoah County.

William Stienberger,
Benjamin Blackford,
Robert Allen,
Anthony Spengler,

J. S. Spengler,
William Carson,
Isaac Overall,
Joseph Arthur.

Berkeley County.

Edward Colston,
John R. Cook,
Philip E. Pendleton,
Moses T. Hunter,

Joel Ward,
William Short,
Elisha Boyd,
Israel Robinson.

Jefferson County.

Hierome L. Opie,
Daniel Morgan,
Bushrod C. Washington,
Braxton Davenport,
Joseph McMurren,
William Butler,
Richard E. Byrd,
Henry Boteler,

John Peter,
Andrew Kennedy,
Henry S. Turner,
Henry Berry,
John T. Cookus,
George Reynolds,
Philip P. Hunter.

Hardy County.

Joseph Williams,
John J. Vanmetre,

Mortimer D. Williams.

Hampshire County.

William Donaldson,
William Armstrong,
Warner Throckmorton,

Robert Sherrard,
William Naylor,
Samuel Kercheval, Jr.

Morgan County.

Cromwell Arrick,
Gassaway Cross,
Joseph H. Sherrard,

James Macky,
Stephen Ogden,
John Sherrard.

Harrison County.

Daniel Kincheloe,
John Cother,
Edwin S. Duncan,

James Pindall,
Benjamin Reeder,
John Webster.

Loudoun County.

Charles F. Mercer,
William Elzey,
William Chilton,

W. T. T. Mason,
W. M. McCarty,
R. H. Henderson.

Fauquier County.

Berkley Ward,
John P. Smith,
T. T. Fauntleroy,
Epper Hunter,

John R. Wallace,
Henry Fitzhugh,
John Marshall, jr.

Ohio County.

Noah Zane,
David Shriver,

James Shannon.

Preston County.

George Hagan.

FROM THE STATE OF MARYLAND.

Washington County.

Thomas Buchanan,
Thomas C. Brent,
Casper W. Wever,
John R. Dall,
Otho H. Williams,

William Fitzhugh,
Thomas Kennedy,
Marmaduke W. Boyd,
Frisby Tilghman,
John Blackford.

Prince George's County.

Joseph Kent,
John C. Herbert,
Benedict J. Semmes,
Edmund B. Duvall,
William T. Wootten,

Abraham Clark,
Thomas Law,
George Semmes,
Julius Forrest,
Robert W. Bowie.

Alleghany County.

John M. Henry,
John M. Mahan,
Michael C. Sprigg,
George Bruce,

John Hoyer,
Upton Bruce,
Jacob Lance.

Montgomery County.

John A. T. Kilgour,
Isaac Briggs,
George Peter,
George C. Washington,
Johnson Hellen,

Archibald Lee,
John Wootten,
Benjamin S. Forrest,
Elisha W. Williams,
James W. Anderson.

Frederick County.

William Goldsborough,
B. S. Pigman,
William Tyler,

John M. Pherson,
Grafton Duvall,
John Lee.

Charles County.

Alexander Greer,
John Barnes,
George Mason,
Wilfred Manning,

John G. Chapman,
William Matthews,
Francis Diggs,
Daniel Jenifer.

St. Mary's County.

James Forrest,
G. N. Caustin,
Athanasius Fenwick,

Peter Gough,
William B. Scott,
E. J. Millard.

City of Annapolis.

Jeremiah Hughes,

Thomas H. Carroll.

FROM THE DISTRICT OF COLUMBIA.

Washington City.

John Davidson,
E. B. Caldwell,
R. C. Weightman,
Thomas Carbery,

Walter Jones,
Thomas Munroe,
Wm. W. Seaton.

Washington County.

N. Luffborough,
S. H. Smith,

Thomas Corcoran.

Georgetown.

John Mason,
John Cox,
Walter Smith,
Clement Smith,

Francis S. Key,
John Laird,
John McLean.

Alexandria.

Thomas Swann,
Jonathan Swift,
Humphrey Peake,

Phineas Janney,
Robert J. Taylor,
Charles J. Catlett.

Levy Court of Alexandria.

Christopher Neale,
Jacob Morgan,

Amos Alexander.

By the Landholders of the District.

David Porter,
Joseph Pearson,

G. W. P. Custis.

At a Convention of Delegates from the States of Virginia, Maryland, Pennsylvania, Ohio, and the District of Columbia, holden at the Capitol, in the City of Washington, on the 6th, 7th, and 8th of November, 1823, the following preamble and resolutions were considered and adopted:

Whereas a connexion of the Atlantic and Western waters, by a canal leading from the seat of the General Government to the river Ohio, regarded as a local object, is one of the highest importance to the States immediately interested therein, and, considered in a national view, is of inestimable consequence to the future union, security, and happiness, of the United States:

Resolved, unanimously. That it is expedient to substitute, for the present defective navigation of the Potomac river above tide water, a navigable canal, by Cumberland, to the mouth of Savage creek, at the eastern base of the Alleghany, and to extend such canal, as soon thereafter as practicable, to the highest constant steam-boat navigation of the Monongahela or Ohio river.

That the most eligible mode of attaining this object, will be by the incorporation of a joint stock company, empowered to cut the said canal through the Territory of the United States, in the District of Columbia, and of the States of Virginia, Maryland, and Pennsylvania; and, therefore, that committees be appointed, each consisting of five Delegates, to prepare and present, in behalf of this Assembly, and in co-operation with the Central Committee, hereinafter provided, suitable memorials to the Congress of the United States, and the Legislatures of the several States before named, requesting their concurrence in the incorporation of such a company, and their co-operation, if necessary, in the subscription of funds for the completion of the said canal :

And, whereas, by an act of the General Assembly of the State of Virginia, which passed the 22d February, 1823, entitled "An act incorporating the Potomac Canal Company," the assent of that State, so far as the limits of her Territory renders it necessary, is already given to this *object*, and for *its* enlargement, to the extent required by the preceding resolution, the said act appears to furnish, with proper amendments, a sufficient basis :

Be it therefore resolved, That it will be expedient to accept the same as a charter for the proposed company, with the following modifications, viz :

That, in reference to its enlarged purpose, the name be changed to "The Chesapeake and Ohio Canal."

That provision be made for the assent of the Government of the United States, and of the State of Pennsylvania, to the said act, and that the act be made to correspond, in its details, with such provision.

That the Chesapeake and Ohio Canal shall be divided into two sections, eastern and western; the former of which shall correspond in description with that of the Chesapeake and Ohio Canal, by the preceding resolution, and the latter shall begin at the western extremity of the former, and terminate at the head of the steam-boat navigation of the Monongahela or Ohio river.

That while the act shall allow a reasonable time for the commencement and completion of both sections of the Canal, no other forfeiture shall be incurred, after the eastern section is finished, for a failure to begin or complete the western section, within the term prescribed, except of the right to complete such section and of all interest therein.

That, while the consent of Pennsylvania is provided for, in the amended act, it shall not be indispensably requisite to the validity of the charter, so far as respects the authority granted by it, to extend the Union Canal to the Pennsylvania line.

That it will be both just and expedient, if not absolutely necessary, to limit the interest of the stockholders of the Potomac Company, in the stock of the Chesapeake and Ohio Canal, in the mode provided by the unanimous resolution of the company, of the 7th day of February last, a copy of which is hereto annexed.

That the said Canal shall not, in width, be less at the surface than 40 feet, at its bottom than 28, nor its depth of water be short of four

feet, except where, from the nature of the ground, it may be necessary, for the greater security of the banks of the Canal, to reduce its breadth at its base to less than 28 feet.

That the act aforesaid be amended, by inserting, in lieu of the 18th section thereof, the following :

And be it further enacted, The right to the waters of the River Potomac, for the purpose of any lateral Canal or Canals, which the State of Virginia or Maryland may authorize to be made, in connexion with the said Canal, is reserved to the said States respectively : that a similar right is reserved to the State of Pennsylvania in relation to the rivers and streams within the territory of that State, the waters of which may be used in supplying the western section of the said Canal : that the Government of the United States shall retain the power to extend the said canal in or through the District of Columbia, on either or both sides of the River Potomac ; and the State of Maryland or Virginia shall be empowered, under the sanction given by the United States to this act, to authorize any such extension for the purpose of meeting any Canal so extended, by any other Canal which either State may deem it expedient to conduct in any direction whatever through its territory.

Provided, however, That no part of the waters of the River Potomac, or of any other river or stream, required to ensure the constant, safe, and convenient use of the navigation of the Canal hereby authorized to be made, shall be, by any such lateral or continued Canal, diverted therefrom to the impediment or injury of the said navigation.

That, in addition to the provision contained in the first section of the act aforesaid, there be grounded, on the event of its failure to furnish adequate funds for the completion of the Eastern Section of the Canal, to be obtained through separate acts of the respective Governments and Corporations of the States of Maryland and Virginia, of the United States, and of the three Cities of the District of Columbia, a subscription, to the amount, if necessary, of 2,750,000 dollars, in the following proportions : $\frac{2}{11}$ to be subscribed by the State of Maryland, $\frac{3}{11}$ by the State of Virginia, $\frac{4}{11}$ by the United States, and $\frac{2}{11}$ by the District Cities, to be divided between them, according to an equitable ratio, to be fixed by themselves. In case a part of the sum aforesaid shall be subscribed, by private individuals, in the mode provided by the act aforesaid, the several States and Corporations, within which such individual subscriptions are received, shall be requested to assume, as part of their aforesaid quotas, the amount of such subscription, under such security as they may deem expedient for the payment thereof, by the subscribers, to them, respectively.

That the Government of the United States be earnestly solicited to obtain the whole of this sum on loan, receivable in four annual instalments, upon the issue of certificates of stock, bearing an annual interest, not exceeding five per cent., and irredeemable for thirty years, and to guaranty the repayment thereof on a specific pledge of the public lots in the City of Washington, of the United States' stock in the Canal, and the public faith.

That the first instalment of the loan be made payable on the 1st of March, 1825, and the last on the 1st of March, 1829.

That the interest of each State and Corporation upon its proportion of the said loan be paid into the Treasury of the United States, according to the terms of the loan, and the principal sum at the expiration of thirty years, the period to be fixed for its redemption.

That, in the event of a refusal by the Government of the United States to negotiate the said loan, each State and Corporation shall provide the amount of its respective subscription in such manner as may seem to it best.

That the maximum profit of the said Company shall not exceed 15 per cent. after the entire Canal shall have been completed; but if, at any time after the completion of the eastern section thereof, and before sufficient funds shall have been otherwise provided for the completion of the western, the tolls of the Canal shall yield a nett income to the stockholders exceeding ten per cent. per annum, such excess shall be applied towards the extension of the Canal until the western section shall have been completed; and, to give more speedy effect to this provision, the President and Directors of the Chesapeake and Ohio Canal Company shall be authorized to borrow, or may negotiate, through a suitable agency, in behalf of the Company on the credit of such excess, or on the tolls or a fixed part thereof, levied upon certain commodities passing through the said Canal, being the probable amount of such annual excess, such sums of money as may be deemed expedient, by a general meeting of the Stockholders, to be applied to the extension of the western section of the Canal, from time to time, till the said section shall have been completed. And if, after the completion of the entire Canal, the nett dividends shall exceed 15 per cent. per annum, such excess shall be applied, first to strengthening the works of the Canal, next to the multiplication of ascending locks from the river Potomac to the level of the Canal, wherever the convenience of the adjacent country may require it; next, to lining the Canal throughout, with such walls of stones as shall accommodate its banks to the use of steam-boats; and should the nett dividends still exceed fifteen per cent. then such excess shall be applied to the reduction of the tolls upon the said Canal, according to some equitable scale.

And be it further Resolved, That a Committee of five Delegates be appointed to prepare, and cause to be presented, in behalf of this Convention, a suitable memorial to the State of Ohio, soliciting the co-operation of that State in the completion of the Chesapeake and Ohio Canal, and its ultimate connexion with the navigation of Lake Erie; and that, for the latter purpose, the memorial shall respectfully suggest the expediency of causing the country, between the northernmost bend of the river Ohio, and the southern shore of Lake Erie, together with the waters of Great Beaver and Cayuga creeks, and all other intervening waters near the said route, to be carefully surveyed, with the view of ascertaining the practicability and probable cost of a Canal, which, fed by the latter, shall connect the former.

That a letter be addressed by the Chairman of the Convention, to the Mayors of Alexandria, Georgetown, and Washington, apprizing, through them, their respective Corporations of the proceedings of this Convention, and inviting their zealous co-operation in giving to them effect.

That another letter be addressed, by the Chairman, in behalf of this Convention, to the President and Directors of the Potomac Company, requesting their concurrence in the measures recommended by the preceding resolutions.

Resolved, That the Committee before named be, and they are hereby, authorized and requested to use their best exertions to obtain the most favorable reception for their memorials, to ascertain and communicate to the Central Corresponding Committee, hereinafter named, such objections, if any, as are opposed to the prayers of their respective memorials; and to devise, if possible, in conjunction with the common friends of the union and prosperity of the United States, the means of obviating all the impediments to their success.

Resolved, That, for the last mentioned purpose, the Delegates of the respective Counties and Corporations, represented in this Convention, be regarded also as Corresponding Committees, and that 13 Delegates be appointed a Central Committee of Correspondence: to confer with the Committees before named, and to hold stated meetings in the City of Washington, for the purpose of consulting upon, and adopting in behalf of the Chesapeake and Ohio Canal, such measures as may seem best calculated to assure its certain and speedy completion.

JOSEPH KENT, *Chairman*.

WALTER JONES, *Secretary*.

List of the several Committees appointed by the Chairman, in pursuance of the resolutions of the Chesapeake and Ohio Canal Convention.

The Central Committee.

Charles F. Mercer
John Mason
Walter Jones
Thomas Swann
John McLean
William H. Fitzhugh
H. L. Opie

Alfred H. Powell
P. C. Pendleton
A. Fenwick
John Lee
Frisby Tilghman
Robert W. Bowie.

Committee for Virginia.

Philip C. Pendleton
H. L. Opie
J. C. Hunter

W. Ellzey
Nathaniel Barwell.

Committee for Pennsylvania.

James Shriver
James Shannon
John McMahan

Daniel Kincheloe
George Hagau.

Committee for Maryland.

Grafton Duvall
Geo. Mason, of Chas. co.
T. Kennedy

J. C. Herbert
James Forrest.

Committee for Ohio.

John McLean
Walter Smith
Benj. S. Forrest

Thos. Carbery
H. Peake.

To Memorialize Congress.

Walter Jones
John Mason
G. W. P. Custis

Robert I. Taylor
S. H. Smith.

Commissioners appointed by the President of the United States, and the Governors of Maryland and Virginia, to open books for subscriptions to the stock of the Chesapeake and Ohio Canal.

By the President—

Samuel H. Smith,
Anthony C. Cazenove,
Clement Smith.

By the Governor of Maryland—

Samuel Sprigg,
Philip E. Thomas,
Frisby Tilghman.

By the Governor of Virginia—

William Ellzey,
Richard H. Henderson,
John C. Hunter.

WASHINGTON, WEDNESDAY, 6th December, 1826.

The Chesapeake and Ohio Canal Convention assembled agreeably to adjournment and to public invitation, this day at 12 o'clock. The chair was resumed by Governor KENT, and WALTER JONES continued to act as Secretary.

The following is the roll of the delegates to the present Convention.

FROM VIRGINIA.

Fairfax County.

Present—

Fitzhugh, William H.
Hunter, John C.
Moss, William.

Absent—

Moore, John,
Moss, Thomas,
Thompson, Robert T.

Fauquier County.

Chapman, S. F.
Fitzhugh, Henry,
Marshall, John, jr.
McNish, William,
Ward, Berkley.

Brent, Robert,
Brooke, Francis William,
Clarkson, Henry M.
Scott, John.

Frederick County.

Barton, William B.
Burwell, Nathaniel,
Page, John W.
Page, Robert,
Powell, Alfred H.

Mason, James M.
Page, William B.

Hampshire County.

Armstrong, William.

Donaldson, William,
Kercheval, Samuel, jr.
Naylor, William,
Sherrard, Robert.

Hardy County.

Seymour, William,
Vanmetre, Jacob J.

Williams, Mortimer D.

Jefferson County.

Davenport, Braxton,
Opie, Hiram L.
Peter John.
Turner, Henry S.
Washington, Bushrod C.

Kennedy, Andrew,
Morgan, Daniel.

Loudoun County.

Present—

Mercer, Charles F.

Absent—

Chilton, William,
 Ellzey, William,
 Henderson, R. H.
 McCarty, William M.

Monongahela County.

Ray, Thomas P.
 Wilson, Alpheus P.

Dougherty, Jos. T.
 Evans, Nimrod,
 Haymond, Thomas S.
 Morgan, Charles S.

Preston County.

McCoy, William.

Hagan, George.

Prince William County.

Hooe, John, jr.

Dade, William A. G.
 Foster, Redmond,
 Gibson, John,
 Hebb, William,
 McRea, John.

Shenandoah County.

Stienberger, William,

Allen, Robert,
 Blackford, Benjamin,
 Carson, William,
 Overall, Isaac.

Shepherdston, Jefferson County.

Briscoe, John,
 Harper, Charles,
 Lucas, Edward.

Lucas, William.

FROM MARYLAND.

Allegany County.

Hoye, John,
 McHenry, John,
 Pigman, B. S.
 Smith, Benjamin B.
 Smith, Samuel P.

Bruce, Upton,
 Sprigg, M. C.

*Annapolis City.***Present—**

Carroll, Thomas H.
 Claude, Dennis,
 Hughes, Jeremiah.

Absent—*Anne Arundel County.*

Dorsey, N., of Lloyd,
 Howard, George, of John E.
 Maxey, Virgil,
 Snowden, T.
 Williams, J. S.

Estep, R.
 Gantt, C. L.
 Hall, T. W.
 Marriott, W. H.
 Ridout, R.
 Stewart, C.
 Thomas, A.

Baltimore City.

Etting, Solomon,
 Howard, Benjamin C.
 Lorman, William,
 McKim, Isaac,
 Patterson, Jos. W.
 Thomas, Philip E.

Ellicot, Thomas,
 Taney, Roger B.
 Tiernan, Luke.

Charles County.

Brawner, Henry,
 Brent, George,
 Digges, Francis,
 Green, Alex.
 Merrick, William D.
 Stonestreet, Nicholas.

Barnes, John,
 Chapman, John G.
 Jenifer, Daniel,
 Matthews, William.

Frederick County.

Dixon, James,
 Duvall, Grafton,
 Hughes, Daniel,
 Johnson, James,
 Lee, John,
 Motta, Lewis,
 McPherson, John,
 Nelson, John,
 Sappington, Thomas,
 Warfield, Henry R.

Schley, Fred. A.
 Slingluff, Jesse,
 Tyler, William.

*Montgomery County.***Present—**

Brooke, Roger,
 Forrest, Benjamin S.
 Kilgour, Charles J.
 Lee, Archibald,
 Magruder, Zadoc,
 Peter, George,
 Washington, George C.

Absent—

Anderson, James W.
 Gaither, Ephraim,
 Leach, Jesse,
 Williams, Elisha W.

Prince George's County.

Bowie, R. W.
 Clark, Abram,
 Duval, E. B.
 Forrest, Julius,
 Herbert, J. C.
 Kent, Joseph,
 Law, Thomas,
 Semmes, George.

Semmes, B. I.
 Wootten, W. T.

St. Mary's County.

Thomas, R.

Ashton, H.
 Causin, J. N.
 Combs, C.
 Gough, P.
 Leigh, G. S.
 Millard, E. J.
 Neale, R.
 Sewall, W.
 Scott, W. B.

Washington County.

Anderson, Franklin,
 Boyd, Marmaduke W.
 Fitzhugh, William, jr.
 Hedrick, George,
 Hitt, Samuel M.
 Keller, Thomas,
 Kennedy, Thomas,
 Reynolds, John,
 Tilghman, Frisby,
 Vanlear, Matthew S.
 Williams, Otho H.

Blackford, John,
 Brent, Thomas C.
 Buchanan, Thomas,
 Dall, John R.
 Gabbey, William,
 Schnebly, David.

FROM PENNSYLVANIA.

Adams County.

Present—

Fuller, John L.
Wilson, James.

Absent—

Stevens, Thaddeus.

*Alleghany County.*Adams, James,
Brackenridge, Alexander,
Crafts, James S.
Craig, Neville B.
Stevenson, James S.
Stewart, R. T.*Beaver County.*Dickey, John,
Marks, William,
Moore, Robert.

Mervin, Enoch.

*Butler County.*Bredon, John,
Negley, John.*Cumberland County.*Alexander, Samuel,
Carothers, Andrew,
Reed, John.*Dauphin County.*Bailey, Joel,
Beecher, Jacob,
Grimshaw, William,
Harris, Robert,
Hummel, Valentine.*Fayette County.*Craft, George,
Dawson, John,
Stewart, Andrew,
Todd, James,
Trevor, Samuel.

Greene County.

Present—

Morris, Jos.

Absent—

Slater, Isaac.

Mercer County.

Cunningham, Thomas, S.

Leech, John.

*Somerset County.*Forward, Chauncey,
Morrison, Abraham.

Williams, James.

*Westmoreland County.*Alexander, John B.
Foster, Alexander W.
Plumer, George,
Wise, Jacob M.*Washington County.*Baird, Thomas H.
Lawrence, Jos.
M•Griffin, Thomas,
M•Kennan, Thomas M. T.
Reed, George W.

From the Convention representing the Counties of Portage and Trumbull, OHIO; and Allegany, Beaver, Butler, and Mercer, PENNSYLVANIA.

Ayles, W., *Prest. Conv.*
Sloane, John,
Whittlesey, Elisha,
Wright, John C.

FROM OHIO.

Belmont County.

Ruggles, Benjamin.

Colwell, Stephen.

*Columbiana County.*Malin, James S.
Sloane, John.

Jefferson County.

Present—

Wright, John C.

Absent—

DISTRICT OF COLUMBIA.

Alexandria City.

Janney, Phineas,
 Mason, Thompson F.
 Peake, Humphrey,
 Smith, Hugh.
 Taylor, Robert I.
 Vowell, John C.

Alexandria County, Levy Court of

Morgan, Jacob.

Alexandria County, Freeholders of

Custis, George W. P.

Georgetown.

Buzzard, Daniel,
 Corcoran, Thomas, jr.
 Cox, John,
 Dunlop, James,
 Key, Francis S.
 Laird, John,
 Mason, John,
 M·Lean, John,
 Smith, Clement,
 Smith, Walter,
 Worthington, William M.

Washington City.

Barbour, James,
 Burch, Samuel,
 Carbery, Thomas,
 Clay, Henry,
 Jones, Walter,
 May, Frederick,
 Munroe, Thomas,
 Seaton, William W.
 Weightman, Roger C.

Davidson, John,

Washington County, Levy Court of

Present—

Corcoran, Thomas,
Smith, Samuel H.

Absent—

Luffborough, Nathan.

Washington County, Freeholders of

Porter, David.

Report of the Committee on Roads and Canals, to the House of Representatives, at the Second Session of the 19th Congress, made January 30th, 1827.

The Committee on Roads and Canals, to which was referred the memorial of the Chesapeake and Ohio Canal Convention, made the following

REPORT :

The Committee on Roads and Canals, to whom were referred the memorial and report of the proceedings of the Chesapeake and Ohio Canal Convention, together with the Report of the United States' Board of Engineers, in relation to the route, plan, and estimated cost, of that Canal, report :

That the memorialists apply to Congress for a sanction to certain alterations of the charter, and for a subscription, on the part of the Government of the United States, to the stock of the Chesapeake and Ohio Canal Company.

The memorial, therefore, required of the committee an examination of the charter of the Company, of the route and dimensions proposed for the Chesapeake and Ohio Canal, and of the estimates of its probable cost and future profits.

The charter originated in an act of the General Assembly of Virginia, entitled "An act incorporating the Potomac Canal Company," which passed the 22d day of February, 1823 : but which, by its own terms, was made to depend, for its validity, on the assent of the State of Maryland, and of a company incorporated in 1784, at the instance of General George Washington, by the concurrent acts of Maryland and Virginia, to render navigable the same river.

Subject to those conditions, this act gave authority to a joint stock company, "to construct a canal from the highest point practicable, on "the north branch of the Potomac, by Cumberland, to tide water in "the District of Columbia." The act omitted to call on the Congress of the United States, the exclusive Legislature of the District of Columbia, within which the canal was to extend and terminate, for an

assent to its provisions : and not receiving the sanction of the Legislature of Maryland, a convention of delegates from certain counties and corporations of the States of Virginia, Ohio, Pennsylvania, and Maryland, and from the District of Columbia, assembled in the city of Washington, on the 8th day of November, 1823, by invitation from a public meeting in Virginia, and by sundry memorials presented in their behalf, to the Legislatures of those several States, and to the Congress of the United States, sought an extension of the purpose of the prior act of Virginia, so as to embrace a connection, by one continued canal, of the tide water of the Potomac, with the steamboat navigation of the Ohio, and the southern shore of Lake Erie. (See ante, page 3, et seq.)

The Ohio company had, as early as the year 1763, laid out the plan of the town of Charlottesburg, adjacent to Fort Cumberland, for the purpose of facilitating a commerce with the Indians, by the navigation of the Potomac ; their boats had ascended the Potomac from the head of the Great Falls, as early as 1749 ; and in February, 1773, the facilities afforded by this navigation, for a commerce with the river Monongahela, one of the branches of the Ohio, were publicly advertised by John Ballendine, of Virginia, in the city of London, in reference to a proposal then under consideration, by the British Government, to establish a "new colony on the Ohio, in North America."

By the company incorporated in 1784, large sums had been expended, exceeding, in amount, 700,000 dollars, in obviating the obstructions to this navigation, by locks, at the principal falls of the Potomac, and the Shenandoah, its longest branch ; and in fruitless efforts so to improve the beds of both rivers, and of other tributaries of the former, as to furnish a safe and easy navigation. (See App. No. 2.)

Those efforts have left the ascent of the Potomac, by a loaded boat, nearly, or quite as costly, as the transportation of the same burthen by land, upon the adjacent roads.

The possibility of substituting a continued canal from the tide, to Cumberland, or to the mouth of Savage river, at the eastern base of the Alleghany, at the ordinary cost of similar improvements along the margin of other rivers alike circumstanced, had not been doubted ; nor could it be, when it was considered, that, with no peculiar obstructions to such a work, the Potomac, between the mouth of Savage and the cities upon its tide, was already navigated : that its whole descent, on a line of 212 miles, was but 890 feet, and from Cumberland, or for 182 miles of that distance, but 578 feet.

That a connection might be effected between the waters of the Potomac and Ohio, by a navigable canal, had been suggested to the Board of Public Works of Virginia, very early after its formation, in 1816. Its practicability was ascertained in 1820, by an actual survey, conducted by the principal Engineer, by order of that board. The result of this survey was made the basis of a report, by a committee, to the House of Representatives, on the 3d of May, 1822 ; was subsequently confirmed, first, by an examination and survey, superintended by commissioners, under the joint authority of the

States of Virginia and Maryland, in the ensuing Summer and Autumn; and, last of all, by repeated examinations and surveys of the United States' Board of Engineers, acting under the authority of Congress, by order of the President. These surveys, begun in the year 1824, have been diligently and patiently prosecuted, until their termination, by a report embracing the estimate of that Board, accompanying the President's message to both Houses of Congress, of the 7th December, 1826. (See App. No. 3.)

The memorial of the Washington Convention to the General Assembly of Virginia, gave rise to "An act incorporating the Chesapeake and Ohio Canal Company," which passed that body on the 27th of January, 1824. (See App. No. 4.)

To this act, the General Assembly of Maryland gave their conditional assent, by an act of the 31st of January, 1825, entitled "An act to confirm an act of the General Assembly of the State of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company." (App. No. 5.)

An act of the Congress of the United States, approved the 3d of March, 1825, complied with the condition expressed in the act of Maryland, and at the same time confirmed the charter, the joint act of both Maryland and Virginia, by authorizing the extension of the canal to any point within the District of Columbia. (App. No. 6.)

The acquiescence of the Potomac Company in the new charter, was expressed, pursuant thereto, by the unanimous resolutions of the Stockholders, in general meeting, on the 16th day of May, 1825; and, in the ensuing Summer, Commissioners were appointed by the President of the United States, and the Governors of Virginia and Maryland, to open books of subscription to the stock of the Chesapeake and Ohio Canal Company. (App. No. 7.)

The charter left so much of the original design of the Convention as contemplated a union of the Ohio, at Pittsburg, with Lake Erie, to be accomplished by the united efforts of the States of Ohio and Pennsylvania. So far as its more limited purpose was completed, it authorized an extension of the Chesapeake and Ohio Canal to the Pennsylvania line, in a prescribed route. This route, the charter divided into two sections, denominated the eastern and western. The first was required to terminate on the north branch of the Potomac, at the mouth of Savage creek, which unites with that river at the eastern base of the Alleghany mountain, thirty miles above the town of Cumberland, in the State of Maryland, amidst the richest beds of coal hitherto discovered on the Atlantic waters of the United States.

The second, or western section, embracing that portion of the canal which the United States' Board of Internal Improvement have denominated, under a distribution of their own, "the western and middle sections," is required to commence at the termination of the first, or eastern section, and to "extend along the valley of Savage creek so far up the same, or any branch thereof, as to enable the canal to reach some convenient point thereon, for connecting the eastern and

western waters, by a tunnel through, or an open cut across, the dividing ridge, between the same; and thence, to proceed to the highest steamboat navigation of the Ohio river, or some one tributary stream thereof, in such direction as shall be best calculated, in the opinion of the President and Directors of the Company, to establish a connected navigation between the eastern and western waters."

The assent of Pennsylvania to the new charter was conditionally accorded by an act, entitled "An act incorporating the Chesapeake and Ohio Canal Company," which passed during the last session of her General Assembly. Among the conditions of this confirmatory act, the third section requires that the proposed canal "*shall be extended to, and terminate at, Pittsburg*"; and the fourth section authorizes the Chesapeake and Ohio Canal Company "to change the route of the western section of the canal, so that it may commence at the town of Cumberland, on the north branch of the Potomac, and be continued from thence, by the valley of Will's creek and by Casselman's river, to the Youghiogeny; and from thence to Pittsburg; provided, that the United States' Board of Internal Improvement, or a majority of them, should deem and report that route to be the best." (App. Nos. 8 and 14.)

The expediency of granting the power provided by this section, was suggested by the discovery that a canal by Will's creek and Casselman's river, across the Alleghany, with a summit level of less elevation by 436½ feet, an abundant supply of water, and a shorter line by at least 18 miles, could be conducted, by means of a prolonged tunnel, over better ground, with greater security from future accidents, than on the more Southern route, before contemplated, between Cumberland, by way of Savage creek, and a point on Youghiogeny river, common to both routes.

To the northern route, therefore, the United States' Board of Internal Improvement, by whom these facts had been ascertained, have given the preference required by the Pennsylvania act just recited; and to procure for the Chesapeake and Ohio Canal Company the power, if they shall hereafter deem its exercise expedient, to adopt this route, is one of the objects of the memorialists.

But, as its adoption might be supposed to supersede the authority, as well as the necessity, of constructing a canal higher up the Potomac than Cumberland, in the valley of Will's creek, the memorialists, for the sake of reaching the coal banks at the base of the Alleghany, seek to preserve the power, in the event that the more northern route from Cumberland, across the Alleghany, shall be preferred, to extend a canal of suitable dimensions to the coal banks at the base of that mountain.

To obviate any possible embarrassment from a doubt of the expediency, there remaining none whatever of the practicability, of crossing the Alleghany, by a continued canal, in either of the proposed routes, the memorialists further ask, that the company be empowered, if they shall deem it more advisable, to substitute, in certain parts of their intended line of navigation, embracing the tunnel and very great

lockage, inclined planes and railways, or an artificial road, for a continued canal.

The committee have felt no hesitation in according to the memorialists all the amendments which they have solicited, and for this purpose report a separate bill.

As it is important to the object of the memorialists, that these amendments shall not be delayed, the committee have, by the terms of this bill, anticipated the legislation of the several States who are parties to the charter, by giving the assent of the United States, should the bill meet with the sanction of Congress, to any future alteration of the route of the canal in its progress west of Cumberland; deeming it perfectly safe to confide to the company, under the control of the States who are parties to their charter, the power to adjust the course of the canal to such views of expediency as the information already acquired, and that which time may supply, shall, in their judgment, hereafter recommend.

By the same bill, the committee, conformably to the wishes of the memorialists, have supplied an explanation of that clause of the act of Congress, of the 3d of March, 1825, which, in confirming the act of the State of Maryland that sanctioned the prior act of Virginia chartering the Chesapeake and Ohio Canal Company, authorized the extension, by that State, of a branch from the main canal through the District of Columbia. Serious doubts have been entertained, in that Commonwealth, whether, by the terms of that clause, an adequate security has been provided for the practical enjoyment of the important privilege designed to be conferred by it. The explanation recommended to the House, by the committee, pursues the intention of the former act of Congress, and will obviate any possible doubt of its just legal construction.

In another bill, accompanying this report, the committee have sought, by one of the conditions of the subscription which they recommend to the stock of the company, to accommodate the interests of the United States, as well as of the States of Maryland and Virginia, in any future extension of a branch from a point of the main canal, within or through the District of Columbia, to the Navy Yard, or to the market towns of either of those States. The subdivision of the canal, next above Georgetown, descending from the head of the Little Falls of the Potomac, according to the recommendation of the United States' Board of Engineers, referred to in the bill, follows the valley of the Potomac to the termination of the main stem of the canal, with an elevation of thirty-seven feet above the tide, until it reaches Georgetown; so as to admit a branch therefrom, by an aqueduct bridge across the Potomac, raised above any possible injury from the river freshets, and to favor the distribution of its water, for commercial and naval purposes, through Georgetown and Washington, as well as its easy extension to Alexandria, and the cities of Maryland. For the same reason, the last mentioned bill requires that the last resort to the river Potomac, for a supply of water, shall be by a

canal designed to serve, also, as a feeder, not less in width, throughout, than sixty feet at the water line.

The committee now come to the last object of the memorialists, which is to procure from the Government of the United States a subscription to the stock of the Chesapeake and Ohio Canal Company, of such amount, and on such conditions, as they deem essential to the commencement, and calculated to assure the speedy accomplishment of their enterprise.

The memorialists ask a subscription to the stock of the canal to the indefinite extent of a moiety of the sum which may be found necessary to its completion, or of a specific sum, supposed to be a moiety of that required for its extension from Georgetown to the mouth of Savage, or to the extensive coal banks at the base of the Alleghany.

The committee have preferred the last form, and have accordingly recommended a subscription of twenty-five thousand shares of stock, to be paid for in not less than five annual instalments; so as to limit the annual payment by the United States to half a million of dollars, and the total sum subscribed to two and a half millions; and they have deferred any farther subscription on the part of the Government, till the eastern section of the proposed canal be completed.

Superadded to the conditions already noticed, the bill which the committee have framed, requires, in order to give validity to any subscription whatever by the United States, that a sum, not less in amount than the above, shall be subscribed by other stockholders, whose good faith it secures by a practicable and adequate guarantee.

As one of the motives of the subscription provided by the bill, is to give to this great work dimensions adapted to future and permanent national use, among the prescribed conditions of that subscription, the committee avail themselves of the scientific research of the United States' Engineers, to provide not only for an adherence to the transverse section recommended for the entire canal by their report; but to include a farther provision for so enlarging the canal, as to reduce, wherever it is possible, without great additional expense, the resistance of the boat, for which the locks of the canal are calculated, to that which such boat would have to encounter in the navigation of an indefinite expanse of water. (App. Nos. 9 & 14.)

The difference of the resistance which this boat would meet, on a canal, having a breadth of forty feet only at the surface, twenty-eight feet at the bottom, with a depth of four feet, compared with that which the same boat would have to overcome on a canal of the breadth and depth of that recommended by the United States' Engineers, demonstrates, irresistibly, the expediency of adopting the last dimensions, where practicable, for the entire canal; and an extension of the same principle warrants the proposed enlargement, where it can be effected, by "ordinary excavation," by which is understood to be meant that of common earth. (See App. No. 9.)

Having required of the Company, as a condition of the United States' subscription, a structure of the Chesapeake and Ohio Canal, which must considerably augment its cost, and which is designed to

make it subserve purposes of great and lasting public utility, rather than of immediate profit, the committee felt themselves authorized, if not bound, to couple, with the United States' subscription, a concession, thus rendered as just as it is expedient, since it might eventually prove indispensable to the prompt success of this great undertaking, that the Government of the United States shall forbear to exact any share of the common profit upon the stock which it subscribes, until all other subscribers shall have netted a reasonable return, or five per centum per annum, for the sums of money that they may have severally paid on account of their respective subscriptions.

The subscription of stock in behalf of the United States, in very large proportions to the total amount required for the construction of very short canals, of easy execution, already commenced, or far advanced towards completion, having been already sanctioned by very large majorities of both Houses of Congress, the Committee do not deem it necessary here to enlarge upon the power of Congress to authorize any such subscription. That to the stock of the Delaware and Chesapeake Canal amounted to 300,000 dollars. The subscription to the Dismal Swamp Canal, grounded on the condition of its enlargement, and requiring no correspondent aid from other subscribers, exceeded its original capital. That to the Louisville Canal, while in progress, bore a larger proportion to its antecedent stock.

Two of these canals, it may be, moreover, remarked, are but expedient substitutes for a navigation before enjoyed along the Atlantic sea-board, circuitous, indeed, but at all times practicable, and safe in peace from any danger but of the sea; and the third, at the Falls of the Ohio, for a navigation open, at high water, to the descent of the largest ships; and impeded, in its worst condition, by a portage of but two miles, along the level bank of a river, through a flourishing town, affording every accommodation to the navigator, in the midst of very short delays. The subscription here invited, and which the Committee recommend, is to a work yet to be begun, but which, if successful, and of that no rational doubt any longer exists, if adequate funds for its execution be supplied, will supersede a navigation not only obstructed, but at all times dangerous, and a portage of many miles, over numerous rugged and lofty mountains, separating a population of two millions of souls from the residue of the same people, who are destined to multiply with a rapidity unexampled but among themselves, on both sides of the great barrier to their friendly intercourse, which this canal is designed to surmount.

The Committee did not unanimously concur in recommending this subscription, without duly considering every other mode of accomplishing a work, as essential, in peace, to the permanent union and commercial prosperity of the Eastern and Western States, as, in war, to their common defence and safety.

They were, moreover, aware, that its accomplishment by the direct agency of the Federal Government, without the intervention or co-operation of a joint stock association, has been deemed, by respectable authorities, preferable to the mode devised by the charter of the

Chesapeake and Ohio Canal Company. In this preference, however, all the practical difficulties have been overlooked or disregarded, arising from the condition and claims of the existing Potomac Company, under their charter; from the absolute denial of the power of the General Government to construct a canal, by one of the parties to that charter: and from the contrariety of opinion on this interesting topic, existing in both Houses of Congress, among those who, admitting the authority of the common Government, derive it from very different sources in the Constitution, and disagree in opinion as to the legitimate mode of its operation. A larger number of those friends of internal improvement, it is believed, will be found to unite in this, than in any other practical application of this much contested Federal power.

The committee also believe, that expediency will recommend the particular mode of executing this great work, in which the Government of the United States has concurred, by the act of the third of March, 1825, and is now urged to co-operate, by a subscription of stock.

That expediency is fortified by the long continued experience of that European nation which, above all others, is most distinguished in every branch of political economy, and it is, moreover, sanctioned by the authority and reason of the father of that science, if science it may be termed, the author of the "Wealth of Nations." (App. No. 10.)

All the canals of Great Britain, with but two exceptions, have sprung from the wealth and efficiency of joint stock companies. (App. No. 11.)

To incorporate private with public wealth, individual interest with public responsibility, in the execution and preservation of a work requiring vigilance to enforce a just economy in its construction, and circumspection to watch over its repairs, is the dictate alike of reason and experience. But, if it were more expedient for the Government of the United States to construct and maintain, at its exclusive cost, works of national utility, it cannot be less prudent to husband its resources for such purposes, by eliciting a moiety, at least, that cost from those private capitalists who can be induced but by the hope of gain, to quicken the diligence and watch over the integrity of the subordinate agents commissioned to disburse the common funds for the common benefit.

The Committee are sustained on the ground of these suggestions, by the consideration that they have been long fostered by the legislation of one State, at least, of this Union: that they were originally incorporated in its system of internal improvement, with this difference only, that, while the subscriptions of the funds of this State are limited to two-fifths only, or less than a moiety of the stock required for a canal or artificial road, promising great public benefit, it forbears any claim whatever to a share of the common dividend or profit of stock in any such work, till all other subscribers to the same stock shall have netted six per cent. per annum on their respective pecuniary contributions. (App. No. 12.)

It is the obvious tendency of such a system, both to economize the authorized disbursements of the public revenue when applied to internal improvement, and to extend the efficiency of a given expenditure, by combining it with that private capital which could not be otherwise elicited, for the common welfare of the United States.

If, in union with these principles, the public appropriations to canals and roads be renewed, from time to time, by the sale and re-investment of the proceeds of the subscribed stock, whenever it shall have replaced the interest of the sums paid for it, and have reached a par value in market, a moderate annuity, devoted exclusively to internal improvement, may have its beneficent agency so widely extended over the United States, as to be competent to every reasonable demand for objects of purely national benefit.

By transferring to the agency of an incorporated company, the construction and maintenance of each public work so executed, that extension of the patronage and influence of the Federal Government which is apprehended from the application of the national revenue to works of internal improvement, will be, also, in a great degree, precluded.

A sum may be laid up, in peace, in an imperishable form, by the completion of works essential to the public prosperity and safety, which the assignable quality of the public stocks invested in their construction would afford to the Government a facility for applying to the first exigencies of future wars.

The internal trade, which, in periods of national danger, or obstructed foreign intercourse, supplants, in whole or in part, the usual importations from abroad, will enhance the value of this resource, when most needed to aid the declining revenue of a Government, resting, almost exclusively, upon foreign imports, for the means of defraying all its most necessary operations.

Against the possible objection that war might be wantonly waged, if, by anticipation, resources were provided to meet its first pressure, without a resort to direct taxation, the countervailing consideration arises that, during its disastrous continuance, it would turn to its unprofitable and wasteful purposes, the means of extending those internal improvements which can hope for their accomplishment only from the leisure and abundance of peace. It is in peace, also, that the additional duties received on those multiplied returns from abroad, for the varied exports with which internal navigation supplies external commerce, would afford an immediate pecuniary recompense to the Government, for its liberal aid in the construction of canals, of national importance, leading into the interior.

If the Committee shall seem to have dwelt too long on considerations not peculiarly associated with the particular object of their present inquiry, their apology will be found, they trust, in the important bearing which these considerations must have on the question, whether, in the present stage of the great national work, which they presume thus earnestly to recommend to the favorable regard of the House, it be expedient to extend towards it the pecuniary aid which

the memorialists have invited? The Committee cannot regard the subscription proposed by the bill which they report, as disproportionate to the relative interests of the Government of the United States in the construction of the Chesapeake and Ohio canal, on the plan recommended by the Board of Internal Improvement. Nor can they perceive a just reason why such a conditional subscription should not precede that which the several States, and the numerous individuals, more particularly interested in the commencement and prosecution of this enterprise, may be expected to supply. As a proprietor, interested in a work to which his subscription is invited; as the exclusive guardian of the District of Columbia; and as the Federal Legislature of twenty-four States; the Congress of the Union may well invite the public co-operation in a work of unrivalled local, as well as national utility.

The Committee proceed to inquire, very briefly, into the extent of those interests, which, under these various relations, the United States have involved in the successful issue of this undertaking.

Among the proprietors, who look to its execution for an appreciation of the value of their landed property, the General Government is incomparably the largest. The value of this proprietary interest, is to be computed in reference, not only to the extensive property of the United States, consisting, originally, of a moiety, and still of a great portion of the city of Washington, in the District of Columbia, but to that vast unappropriated domain beyond the Alleghany, which still looks to emigration to people and improve it, and from the sale of which an annual revenue of two millions of dollars is now anticipated. (Appendix, No. 13.)

By greatly cheapening the intercourse between the East and the West, the heavy expenditure which the emigrant now incurs, in a protracted journey over numerous mountains, will be converted into an additional fund for the purchase of public lands, and their value enhanced, by affording to the purchaser a new facility for reaching, without hazard, both in peace and war, the improved markets of the Atlantic, with the diversified productions of his labor and industry.

In regarding the actual condition of a part of those markets, a second interest is developed, accompanied by a high political obligation; that of the exclusive sovereign of a district of country, narrow, indeed, in dimensions, but embracing all the cities of the Potomac, and the district of country to which the proposed canal is to be immediately conducted. If it would be the interest of those cities, had they the pecuniary ability, to construct such a canal, at their exclusive cost, the Government which has confided to it the power of legislating for their benefit, cannot be insensible of the high obligation to promote that interest, which the acceptance of so solemn a trust necessarily implies. Not only the prosperity, but the future safety, of the people of this District puts up an urgent claim to the exercise of a sovereign authority entrusted to the Central Government of the United States, not for their benefit alone, but for the permanent advantage, security, and honor, of the entire Union. The District of

Columbia is not bound to the Union as a State, but as the immediate subject of the Government of all the States. It is, in truth, the property of the whole Union ; and whatever advances its prosperity, is of immediate importance to the general welfare of that Union. The exclusive legislation of Congress over the District of Columbia, combines both Federal and State authority ; is a complete sovereignty, one and indivisible. Having such a power over the territory and people of the District, for the benefit of the Union, the Congress are invoked to its beneficent exercise, not only by all those considerations to which a State may appeal, in addressing its local Legislature, but by all those Federal obligations to the States themselves, which are involved in the exclusive legislation of the General Government over the seat of its deliberations, and the political centre of its operations.

If the Legislature of a single State might legitimately labor to attract to the bosom of its territory the vast and increasing commerce of the West, so may the Congress of the United States to the District of Columbia ; and so they are, therefore, bound to do, if it be practicable. The extent of this obligation, in relation to the construction of that channel which the Chesapeake and Ohio Canal provides for accomplishing this object, is not to be measured, as has been sometimes suggested, by the relative proportion which the length of so much of this canal as will lie within the territory of the District, bears to its whole line, since such a ratio is not an adequate standard of the relative benefits to be derived from its completion, to the various portions of territory through which it must pass. Were this otherwise, the extensive States and remote Territories on the immediate banks of the Ohio and the Mississippi, or intersected by their numerous tributaries, would have their immeasurable interest in the execution of this great work expressed by the very small proportion which the single point that it proposes to touch at Pittsburg, bears to the whole line of continuous navigation which the canal will establish across the Alleghany, between the Atlantic and the numerous rivers of the West.

The interest of a great market in that channel of trade, which draws to it the various productions of the industry of a vast empire, is to be measured by the entire profits of that trade ; and, if the profits of the commerce of the West, or any considerable share of them, be assumed to be the measure of the interest of the District of Columbia, in the proposed canal, and to promote that interest be a duty of its exclusive Legislature, the subscription of a moiety of the stock of the canal is not more than commensurate with the obligations of the Federal Government to the People confided by the Constitution to its provident care.

Can this obligation be evaded by limiting the extent of the United States' subscription to this canal, by that portion of the public revenue derived from the People of the District of Columbia ?

That they are unrepresented, would furnish a fair ground of implication that they should be untaxed, under a Government owing its existence to the principle that taxation, without representation, is

tyranny. But the People of the District are subject to the same species of taxation with all the citizens of the United States, under a system of revenue, which, founded on the consumption of foreign imports, precludes the application of any exact estimate of the amount of their contribution to the common treasury. If greater precision were attainable, the committee are totally at a loss to conceive how it could warrant a conclusion at variance with that at which they have arrived.

In founding a durable work, its remote as well as proximate benefits are to be regarded, and what scale of measurement can determine the future extent of the population, wealth, and consequent consumption of the District of Columbia, if it shall become, as its great founder confidently anticipated, the emporium of the West?

The end of the delegation to the Federal Government of any power whatever over the District of Columbia, was simple, indivisible, and of universal interest.* For the promotion of this end, the common Government may rightfully, and must, necessarily, command the common revenue of the Union. Whatever augments the wealth and population of the District, adds to the security of the seat of the Federal Government of all the States. The prosperity of the District and of the Union cannot, therefore, be severed. A neglect to promote, by all practicable and ordinary legal means, the welfare of a People who have no Government but that of the United States, would not be less dishonorable, than to decline the exercise of an acknowledged Federal power, when manifestly required for the benefit of the American People. The power of Congress over this District, vested by the Constitution, is, therefore, accompanied by obligations of high dignity, that can be surrendered, neglected, or abandoned, only by a dereliction of duty, little short of a violation of the letter, as well as of the spirit of the Constitution itself.

The memorialists appeal, moreover, to the relation of the Federal Government to the States, which it unites, in behalf of a work calculated to perpetuate to the American People, and their latest posterity,

* Act of cession by the State of Virginia distinctly sets forth this end.

"SECT. 1. Whereas the equal and common benefits resulting from the administration of the General Government will be best diffused, and its operations become more prompt and certain, by establishing such a situation for the seat of the said Government, as will be most central and convenient to the citizens of the United States at large, having regard as well to population, extent of territory, and a free navigation to the Atlantic ocean, through the Chesapeake bay, as to the most direct and ready communication with our fellow-citizens in the Western frontier: *And whereas* it appears to this Assembly, that a situation combining all the considerations and advantages before recited, may be had on the banks of the river Potomac, above tide water, in a country rich and fertile in soil, healthy and salubrious in climate, and abounding in all the necessities and conveniences of life, where, in a location of ten miles square, if the wisdom of Congress shall so direct, the States of Pennsylvania, Maryland, and Virginia, may participate in such location:

Be it therefore enacted by the General Assembly, That a tract of country, not exceeding ten miles square, or any lesser quantity, to be located within the limits of this State, and in any part thereof, as Congress may by law direct, shall be, and the same is hereby, forever ceded and relinquished to the Congress and Government of the United States, in full and absolute right, and exclusive jurisdiction, as well of soil, as of persons residing, or to reside thereon, pursuant to the tenor and effect of the eighth section of the first article of the Constitution of Government of the United States."

the blessings of peace, freedom, and independence : objects, which, in themselves, can have no limit to their value ; because, without them, all other advantages, public or private, national or individual, are precarious and fleeting. The expediency of providing for objects of such magnitude, can be bounded only by the extent of the public resources. And no provision, among the many internal improvements which solicit the favorable countenance and pecuniary aid of the Federal Government, can surpass, in this tendency, the Chesapeake and Ohio Canal. Extended, as was originally contemplated by the memorialists, and is now found practicable, from the Chesapeake to Erie, by Pittsburg, it unites, by one unbroken line of navigation, the shortest that can be devised, the seat of the Government with the three great limits of the United States : the Atlantic Ocean, the Gulf of Mexico, and the great Northern Lakes.

No State of this Union ; not one of its many markets ; no branch of its industry, whether it speed the plough or spread the sail, or ply, at home, the shuttle or the hammer ; whether its activity be exerted on land or the sea, to the North or South, the East or West ; is without an interest in the accomplishment of this national work.

The committee deem it unnecessary farther to enlarge upon a topic, which, if it claim the exercise of a constitutional authority, more questionable than either of those powers on which this report has hitherto relied to warrant the appropriation that it recommends, rests that claim on the strongest ground that can be presented to the General Government—in behalf of a canal connecting the seat of its deliberations and the source of its political action with the remotest extremes of its wide-spread territory. A work which, in the number of interests which it has sought to harmonize, as well as in the complicated political agency which the charter to construct it required, illustrates, alike, the extent of its utility and the difficulty of its accomplishment, without the authority and aid of a common Government. Having been brought, by great preparatory labor, to its present condition, it awaits, for its future progress, the acquisition of adequate funds to commence its operations. And, for these, it relies, as must every similar undertaking, on the wisdom, enterprise, and resources of all the interests, national and local, public and individual, involved in its successful prosecution.

Should the Government of the United States, however, regard as insufficient to warrant the aid which the committee have proposed to the House of Representatives to extend to this work, all those considerations arising from its relation to the national domain, to the prosperity of the District of Columbia, and to the welfare and safety of the Union, still there remains another ground on which to rest the expediency of the proposed subscription. For, although, according to the terms annexed to it in the bill reported by the committee, the profit to be derived from the canal, by the United States, is made contingent, and dependent on the prior profit, to a limited extent, of all other subscribers to the stock of the canal ; yet the general views which have been presented, and those which a closer investigation

will superadd, must induce a confident belief that the public Treasury, should its claim to profit be deferred for a time, will be ultimately reimbursed all that it is invited to advance, with ample interest.

The report of the United States' Engineers, by the application of a simple principle of experimental philosophy to inland navigation, has demonstrated, that, if the execution of the Chesapeake and Ohio Canal be completed, according to the plan which they have recommended, the labor and the time, and, so far, the expense of transporting a given burthen upon its surface, notwithstanding its greater lockage, will be less than is encountered upon the Erie canal of New York, by which it is exceeded in length but a few miles. (See App. No. 14.)

Its tolls, if regard be paid to profit, must depend, indeed, upon its actual cost; but the laborious and patient investigation accompanying the proceedings of the memorialists, manifests that this work can be constructed at a cost much less than the amount of the estimate of the United States' Engineers, and the committee have derived from their own body, as well as from other sources, satisfactory assurances in confirmation of the reduced estimate of the Convention. They are also apprized, that, at the present moment, the expense of every species of industry employed in constructing the New York canals, is so greatly lessened, that, if that work were again to be constructed, with the experience which it has purchased, its cost would probably be reduced one-third in amount. Its actual cost has not, however, fallen far short of the sum at which, it is believed, the Chesapeake and Ohio canal can be completed, including the expense of an enlarged tunnel. But, had the Erie canal cost the State of New York a much larger sum, there exists not a doubt that the great State which has, so much to its honor, executed this useful enterprise, would deem its capital profitably invested. (See Appendix, No. 15.)

Extending the comparison, which the United States' Engineers have instituted, between the *expense* of transportation, on both canals, to the *relative use* which will probably be made of them, so as to judge of their *comparative profit*, several important considerations will be found to concur in favor of the canal which shall immediately connect the tide of the Potomac with the steamboat navigation of the Ohio: and, if the result of this comparison be in favor of the Southern canal, the expediency of a subscription to its stock will not be questioned.

The committee might comprehend, in this view, very many interesting details; but they will confine their inquiry to the narrowest scope consistent with their object.

The first advantage of the more Southern canal, over that of New York, is derived from its latitude. It will be free from ice a month later in Autumn, and a month earlier in the Spring, in the annual period during which both canals are used. A difference in favor of the Chesapeake and Ohio Canal will exist of two months in nine, or the ratio of this advantage will be expressed by nine to seven, which is equivalent itself to 28 $\frac{1}{2}$ per cent., if the use of each month's navigation were the same. But the first month of Spring, and the last month of Autumn, should be the most profitable months of the year, if reference

he had to the natural history and consumption of the productions of agriculture and the arts, whether foreign or domestic, which this canal will waft to and fro, between the Southwest and the East. The tobacco, hemp, and salted provisions of Kentucky and Ohio, the cotton and sugar of Tennessee, Mississippi, Alabama, and Louisiana, will profit by the latest, or seek the earliest transit in the year towards the Atlantic, while those manufactures, the consumption of which varies with the season, as the light cottons of the East, and the cloths of the West, will, for Summer and Winter use, be transported early in the Spring, or late in Autumn. It is in the former season that a peculiar burthen on the Potomac canal, derived from the inexhaustible fisheries of that river, will seek an inland transportation from the sea board.

A superior advantage to that of latitude will be derived to the Southern canal, from the consideration, that, while it begins on the navigable waters of the Chesapeake, it connects them, by an *uniform line* of inland navigation, with the populous and thriving regions of the West—the valleys of the Ohio and the Mississippi, and of their numerous tributaries. Much time must elapse before the Erie canal can hope to derive a substitute for the trade of these valleys, in the improvement of the shores of those lakes which it unites with the Hudson, one border of which is the property of a foreign and rival nation. Even this trade, a canal from Pittsburg to Erie will render common to both. And should, as is much to be desired for the common benefit of the Union, an inland navigation be effected between a point at Pittsburg, common to both canals and the Erie canal of New York, still, the completion of the canals about to be constructed, from the Potomac to the Patapsco, from the Chesapeake to the Delaware, and from the Delaware to the Raritan, will render it far easier for the great mart of New York to carry on an extensive trade with the West by the Southern route, than by her own canal.

In contemplating the relative extent of that bordering country from which supplies may reach either of these great lines of inland navigation, the comparison which the committee are pursuing will be perplexed with greater difficulty. Still, it is obvious, on the one hand, that, to the North of the Erie Canal, Lake Ontario furnishes, for a large part of its entire line, an unprofitable lake border at no great distance, while both Pennsylvania and Maryland, through the headwaters of the Delaware and Susquehannah, are endeavoring to draw off to their respective emporiums the productions of the South. From the numerous lakes of New York, and their fertile shores; from the rich bottoms of the Genesee, this canal derives vast supplies for distant transportation; but so will the Chesapeake and Ohio canal, from a country scarcely less fertile: the lime-stone valleys of the States of Virginia, Maryland, and Pennsylvania, by means of the navigation of extensive rivers, such as the Shenandoah, and the South Branch, or the Monocacy, the Antietam, and the Conogocheague, that only await the completion of the Eastern section of the Chesapeake and Ohio Canal, to pour the produce of their fertile banks upon its bosom,

Five hundred miles of *such navigation* are already used, and can be more easily improved than the river Potomac, because it extends along the surfaces of rivers, whose course is parallel to the numerous mountains, through which the Potomac abruptly penetrates. Even those mountains, covered with heavy forests, and replete with metallic and mineral treasures, more than make up for the plaster and salt which supply a part of the tonnage of the Erie Canal. (See App. No. 16.)

The Committee, indeed, very confidently believe that, on the single article of coal, an estimate might be founded, sufficient, of itself, to assure a liberal profit on the entire cost of the eastern section of the Chesapeake and Ohio Canal. (See App. No. 17.)

The most profitable canals in England, are those that serve to distribute, for consumption, this valuable fuel, which enters, as a necessary of life, into the price of all human labor, and constitutes the *primum mobile* of so many arts.

In no part of that kingdom, however, nor in any region of the United States, East of the Alleghany, can it be drawn from its native beds at so little cost, as at the head of the Potomac navigation, where it is elevated in parallel strata, nearly horizontal, above the surface of the proposed canal, and will be adjacent to its banks, or form a part of them. Less than one cent a bushel, or twenty-eight cents the ton, will be required to load the boats, which transport it; four cents will pay for its transportation, in boats adapted to the canal, from the coal banks to tide water; and allowing five cents for the canal toll on each bushel, it can be sold, in the markets of the District, with a mercantile profit of twenty-five per cent. at twelve and a half cents the bushel, or very little more than one-third of its present cost, in domestic use.

When, added to the other almost innumerable uses of this commodity, that application of it be regarded, which the same region of country favors, (abounding as it does, both in limestone and iron ore,) to the smelting and manufacture of iron, in all its branches, it is difficult to place any limits, but those which the charter of the Chesapeake and Ohio Canal Company annexes, to the future profits of its stock; and no doubt can exist but that the use of this canal, must always exceed in extent that of the canal, which connects the Hudson with Lake Erie. (See App. No. 18.)

The Committee have no other purpose in view, in the comparison which they have made between these great national works—for in their utility they both partake of that high character, though happily for New York, they will not, in the resources applied to their construction—than to manifest the expediency of that subscription to the stock of the one which the United States were, when earnestly invited, unable to afford to the other. (App. No. 19.)

There can be no rivalry between two canals which, however, improved, will, at a period not remote, be totally inadequate to waft the boundless supplies with which the agriculture and the arts, the internal and foreign trade of an immense empire, will crowd their surface.

The committee believe that the time is not far distant, when, if every drop of water that can be commanded for the supply of continuous canals across the elevated summits which divide the Eastern and Western waters, shall be brought in use, the whole quantity will not suffice to waft between them the exchangeable surplus productions of the labor, enterprise, and capital, of the extensive territories on their borders. (App. No. 20.)

All local interests should learn from this suggestion, if founded in truth, that they have no cause for jealousy, and much for concord, in the great work of internal improvement, of which the Chesapeake and Ohio canal constitutes but a single, though an essential feature.

The Committee would have delayed their report, could they have hoped to obtain, in any short period, sufficient data on which to found an examination of the financial ability of the public treasury to spare in the mode, and at the time proposed, the sum which they have inserted in one of the accompanying bills, as the amount of the United States' subscription to the stock of this canal. (App. No. 21.)

They believe that the completion of the proposed canal, by augmenting the exports, and consequently the imports, of the United States, would bring in to the public treasury an annual return, exceeding greatly the interest on the sum which the Government is invited to subscribe. That return will, also, increase in proportion as the canal is extended, or the payment of the annual instalments of this subscription proceeds. This will not be deemed too sanguine an estimate, when it is reflected that the freights, and commission, and insurance, as well as all other charges of exportation, are paid by the value of those imports which are chargeable, by the customs, with an average duty of not less than twenty-five per cent. If, therefore, an addition be made by the proposed canal, to the amount of those exports, of but one-fifth in value of the sum subscribed by the United States, the duties on the correspondent imports from abroad, will annually return to the public treasury more than five per cent. on the total sum subscribed. Such subscription, therefore, will accelerate, rather than retard, the payment of the public debt. (See App. No. 22.)

Sums of money judiciously invested in canals, if they at first yield little profit, are, in truth, but loans, the principal of which is inviolably secure, and their rate of interest certain of speedy and constant augmentation. In the estimate of their probable returns, the commerce which they create, must be added to that which they merely facilitate.

Subscriptions to the structure of canals may be founded on loans, therefore, without affording to posterity cause to complain; since their benefit descends unimpaired with the debt which they contract, the cheap price of the countless blessings which they diffuse.

APPENDIX.

No. 1.

See Memorial, ante, page 3.

No. 2.

Proposals for opening the navigation of the river Potomac—printed in London, in 1773, by John Ballendine.

Whereas the removing the obstructions in the rivers James and Potomac, in the Colony of Virginia, in North America, and thereby making a more easy and *cheap* communication, than there is at present between the several seaport towns on these rivers, and the numerous and populous settlements upon the upper parts thereof; and also between the said seaport towns, and the rivers Monongahela and Great Kenhawa, *in the proposed new colony, upon the back of Virginia and Maryland*, will greatly increase the yearly demand for, and consumption of, British manufactures, and promote the culture and importation of hemp, tobacco, flax, &c. into this kingdom: And whereas John Ballendine, of the county of Fairfax, in the said Colony of Virginia, gentleman, being well acquainted with the said rivers, and having skill and judgment in water works, and having already made several useful improvements on and in the said river Potomac, did, in the beginning of the year 1772, represent to the respective Governors and Councils and General Assemblies of the Colonies of Virginia and Maryland, and to the other principal inhabitants thereof, that if they, by their several donations and otherwise, would countenance and encourage his undertaking, he would engage to remove the obstructions in, and render more navigable by locks, &c. than are at present [for large boats and barges] the said rivers James and Potomac, from the tide waters of the same to the *heads* thereof: And to the end that he, the said Ballendine, might receive every necessary information for the perfect completion of the business aforesaid, he did undertake to embark for the kingdom of Great Britain, and examine the canal in Scotland, from Carron to Clyde, and the canals, locks, &c. of the Duke of Bridgewater, &c. And whereas his Excellency the Earl of Dunmore, Governor of the Colony of Virginia, his Excellency Robert Eden, Esq. Governor of Maryland, the Right Honorable Lord Fairfax, and most of the principal Gentlemen of the said Provinces, were so fully convinced of the knowledge and integrity of the said Ballendine, and of the facility and great utility of rendering the said rivers

Potomac and James more extensively navigable than they are at present, *did*, therefore, on the 9th day of May, 1772, promise and oblige themselves, and their heirs, &c., by a certain instrument of writing, bearing date the same day, to pay to the said Ballendine, and his assigns, the respective sums of money therein written, opposite to their several names, as upon reference being had to a copy of the said instrument (authenticated under the seal of the county of Prince William, in the said Colony of Virginia) will more fully and at large appear. And whereas the said Ballendine, in conformity to his engagement as aforesaid, did embark for this kingdom, and has, since his arrival therein, examined the great canal in Scotland, and several others in England, and has obtained plans and models of many necessary machines and works, and has engaged several ingenious mechanics to go with him to North America, for the purpose of opening and rendering more easily and extensively navigable, the said rivers James and Potomac: And whereas we, the subscribers, being willing and desirous to co-operate with our fellow subjects in Virginia and Maryland in so beneficial and public-spirited an undertaking, do promise and oblige ourselves, and our executors, and administrators, (each for himself, and not one for another,) to pay to the said John Ballendine, his heirs and assigns, the following respective sums, written opposite to each of our names, and at the times, and under the conditions and limitations hereafter mentioned; that is to say:

First, That the sums of money hereunto subscribed, and all such farther and other sums as have been or shall be subscribed, either in North America or elsewhere, shall be faithfully and solely applied to, and disposed of, for removing the obstructions in, and rendering more open and extensively navigable, than are at present (as aforesaid) the said rivers Potomac and James, from the tide waters of the same, (or as far as sea vessels do *now* sail *up* these rivers) to such parts of the *heads* of the said rivers; as from *thence*, the shortest and most convenient wagon roads can be made, to the rivers Great Kenhawa and Monongahela, in the intended new Colony aforesaid.

Secondly, That the said rivers, from the tide waters thereof to such parts of the *heads* of the same, as aforesaid, shall be so opened, and rendered more easily and extensively navigable, as that the intended locks and canals shall *always* have four feet water in them [that being the general depth of the said rivers James and Potomac]—and barges, of at least 50 tons burthen, may also, when laden, be employed on the said rivers from the tide waters thereof, to the heads of the same, as aforesaid.

Thirdly, That inasmuch as it is intended that the said rivers shall be so rendered more open and extensively navigable, by the voluntary subscriptions of gentlemen both in North America and in Great Britain, it is, therefore, expressly covenanted and conditioned by the subscribers, to and with the said John Ballendine, that no other tax, duty, or impost, shall, at any time hereafter, be laid or levied upon any articles or commodities going up, or being sent down, the said rivers Potomac and James as aforesaid, except such only as the respective

Legislatures of the Colony of Virginia, and Province of Maryland, shall, by concurrent acts of Assembly, charge the said commodities with, for the sole purpose of paying the expenses attendant on the said locks and works, and keeping the said rivers, and the channels thereof, *free* from logs or other obstructions, which may occasionally be brought down the same, in the time of freshets.

Fourthly, That the said John Ballendine shall keep a fair and just account of all the particular costs and expenses, which shall arise and be incurred in the removing of the obstructions, erecting locks, &c. in the rivers Potomac and James, (as aforesaid) until the same is finished.

Fifthly, That all the said accounts of the costs, expenditures, and charges, as aforesaid, with their several and respective vouchers, shall be submitted to the examination and final adjustment of six gentlemen, to be nominated and appointed as follows, viz : Two thereof to be nominated and appointed by and under the hand and seal of the Governor of the Colony of Virginia for the time being ; two to be nominated and appointed by and under the hand and seal of the Governor of the Province of Maryland for the time being ; and the remaining two to be nominated and appointed under the hand and seal of the honorable Thomas Walpole of the county of Middlesex, in the Kingdom of Great Britain ; any four of which said Commissioners, from time to time, meeting, adjusting and settling the said accounts, and delivering a copy thereof, when so settled, signed by each and every of them to the Governors, severally, of the Provinces aforesaid, to be lodged and deposited by them, in the respective Rolls Office, or Office of Registry in the said Colonies, shall be deemed final and conclusive ; and in and by such accounts, and no other, the said Ballendine shall be credited for the costs, expenditures, and charges, as aforesaid, (and also for his expenses to and from this kingdom, and a compensation for his services, &c. as mentioned under the sixth head,) and therein likewise shall the said Ballendine be debited for such sum or sums of money, as he shall have received or may receive, in and by virtue of subscription made, or to be made, in Great Britain, or North America, for the purposes aforesaid.

Sixthly, That the said John Ballendine shall be paid out of and from the money so subscribed as aforesaid, such reimbursement for his expenses to and from this kingdom ; and also such compensation and reward for his skill, judgment, and industry, in directing, managing, and completing the business of rendering the said rivers James and Potomac more easily and extensively navigable, as aforesaid, as they, the said Commissioners, or any four of them, shall certify under their hands, to the respective Governors of Virginia and Maryland, for the time being, that the services of the said John Ballendine do merit and are entitled to.

Seventhly, That so soon as it shall appear, by a certificate signed and sealed by the Governors of the Colonies of Virginia and Maryland, respectively, and by two of the Council of each of the said Colonies, that the said John Ballendine has rendered complete and suf-

ficient, by locks and otherwise, as aforesaid, one half of the whole intended navigation of the said rivers James and Potomac, and that barges, of at least fifty tons burden, can pass loaded up and down the said rivers, from the tide waters thereof, to the end of the said finished and completed navigation; that then, we, the subscribers, do oblige ourselves, severally, and not jointly, and our several executors and administrators, to pay to the said John Ballendine, his executors, administrators, and assigns, the one moiety or half part of the several following sums of money, written by us opposite to each of our names; and, so soon as the whole of the said intended navigation, on the said rivers James and Potomac, shall be fully made and completed, by locks and otherwise, as that barges of at least fifty tons burden shall, when loaded as aforesaid, pass up and down the said rivers, from the tide waters thereof, to the heads thereof, as is specified and particularly mentioned under the first head; and so soon, likewise, as the same shall be certified to us under the hands and seals of the Governors of the Colonies of Virginia and Maryland, respectively, and of two of the Council of each of the said Colonies; that then, we, the subscribers, do, as aforesaid, oblige ourselves, and each and every of our executors and administrators, (severally, and not jointly,) to pay to the said John Ballendine, his executors, administrators, and assigns, so much, and *no more*, of the remaining moiety of our following respective subscriptions, as shall, (together with the money that may be collected in North America, for the purpose aforesaid,) be sufficient to pay the amount of the liquidated and settled accounts of the said Ballendine, as mentioned and described under the fifth head.

In testimony whereof, we have hereunto set our hands and seals, in Great Britain, this ——— day of ———, one thousand seven hundred and seventy-three.

Transcript from an original contract between Thomas Walpole, W. Pownall, B. Franklin, and Samuel Wharton, relative to the Colony here alluded to.

“We the Committee of the purchasers of a tract of country for a new Province, on the Ohio, in America, do hereby admit the Ohio Company as a co-purchaser with us, for two shares of the said purchase, in consideration of their Agent, Col. * * * * * to withdraw the application of the said Company, for a separate grant within the limits of the said purchase.

“Witness our hands, this 7th day of May, 1770.

“THOMAS WALPOLE,
 “W. POWNALL,
 “B. FRANKLIN,
 “SAMUEL WHARTON.”

“The whole being divided into seventy-two equal shares ; by the words ‘two shares’ above, is understood, two seventy-second parts of the tract, so as above purchased.

“THOMAS WALPOLE,
 “W. POWNALL,
 “B. FRANKLIN,
 “SAML. WHARTON.”

In a printed advertisement, dated “London, February 25th, 1773,” of the cost of carriage from the seaports of Georgetown, in Maryland, and Richmond and Alexandria, in Virginia, to the proposed new colony on the Ohio, in North America, by John Ballendine, of Virginia,” the following particulars are narrated :

It is proposed by Mr. Ballendine that the locks intended to be erected in the rivers James and Potomac, shall *always* have four feet water in them, as that is the general depth of these rivers, except in the Spring and Autumn, (which are the great periods of exportation and importation from and into Maryland and Virginia,) when these rivers usually have from 6 to 8 feet water in them.

Mr. Ballendine is thoroughly convinced, from an experience of fifteen years in transporting merchandise up and down the river Potomac, that all kinds of British goods can be carried from Georgetown (which is a seaport on that river, at least twelve miles above Alexandria, where General Braddock landed his troops,) to the head of the north branch of the navigable waters of Potomac, at 6*d.* sterling per hundred weight ; and at the same price, also, goods can be carried from Richmond, (a seaport town,) on James river, to the head of that river. He proposes, at first, to employ barges of only 60 feet keel, 15 feet wide, and 3 feet in depth, which will not draw more than two feet water. But when the country on the Ohio is thickly settled, barges of 150 and 200 tons can (as is now done on the Thames) be properly made use of on the rivers James and Potomac.

It requires but three days for the barges to go down the stream, from the head of the north branch of the navigable waters of Potomac, to the seaports of Georgetown and Alexandria ; and only the same space of time, from the head of James river, down stream to the seaport of Richmond, in Virginia ; and from thence back again, up stream, to the head of James river, only eight days ; and the same time from Georgetown, or Alexandria, up stream, to the head of the navigable waters of the north branch of Potomac.

Mr. Ballendine submits to the consideration of the public, whether a freight, as above, of 6*d.* per hundred weight, will not produce great and uncommon profits to the owners of the barges employed on Potomac and James rivers ; for the freight of 50 tons of tobacco, hemp, iron, flax, &c. down stream, from the head of James river to

Richmond, or from the head of Potomac to Georgetown or Alexandria, at 6*d.* per hundred weight, will amount to (sterling) £25 00 0
 Say the barge should carry but half a freight of British merchandise from Georgetown, or Alexandria, or Richmond, up stream, to the head of the Potomac, or James river, at 6*d.* per hundred, it will amount to - - 12 10 0

£37 10 0

Deduct the wages of nine men, at 1*s.* 6*d.* per day, for 14 days, (which is allowing 3 days for loading and unloading) amounting to - - - - 9 9 0

Profits on each voyage of 14 days, will be to the bargeman £28 1 0

On the 1st day of August, 1772, Mr. Ballendine went from the head of the north branch of the navigable waters of Potomac to the river Monongahela, in the proposed Ohio province. He went on purpose to ascertain the distance between these rivers; and, to the best of his judgment, he is convinced it is not, at most, more than ten or eleven miles.

He also ascertained the distance between the navigable head waters of James river and those of the Great Kenhawa, and found it not to exceed four miles.

Mr. Ballendine has been for many years engaged in iron works in the back parts of Virginia, and says, that the settled price of wagonage in that colony is eight shillings sterling per day, for each wagon carrying twenty hundred weight; which makes the rate of carriage from the waters of Potomac to those of the Ohio only 4½*d.* per hundred weight; and of course it makes the land carriage, between the head of James river and the Great Kenhawa, not half as much.

N. B. It should be here remarked, that, in this estimation, no deduction is made for the back carriage of hemp, &c. from the New Province to the waters of Potomac or James river.

Total expense of transportation from Alexandria or Richmond, in Virginia, or Georgetown, in Maryland, to the new Province, will not be more than as follows, viz :

By the barges, to the head waters of Potomac or James river, at 6*d.* per hundred, - - - - £0 0 6

By the wagons from thence to the navigable waters of Monongahela, 4½*d.* (or to the Great Kenhawa, not above 2*d.*) - - - - 0 0 4½

Total per hundred weight, - - - - £0 0 10½

Brief description of the Works executed by the Potomac Company, with the lockage and command of water thereon.

The Potomac Company, in pursuance of the powers granted to them, by their charter, have executed the following works :

1st. Large canals taken out of the river Potomac, and conveyed through locks around the principal falls. Of these, the chief are the works of the Great Falls, where the difference of level, 76 feet 9 inches, is surmounted by a series of five sets of locks, of solid masonry of stone, each 100 feet in length, of the various width of from 10 to 14 feet; of the lift of from 10 to 18 feet; and of the cubical contents of from 18,000 to 25,000 feet; a set of guard-locks, and extensive basin. And a canal, in length 1200 yards, lined with walls of stone. Of the lock seats, the two lower pair have been excavated entirely from the solid rock, and exhibit an imperishable monument of perseverance and skill.

At this situation, the Potomac Company have acquired, in *fee simple* 16 acres of land, at an uniform width of 140 feet, for the location of the canal and locks, and one acre further, for the erection of necessary buildings.

At the Little or Lower Falls, the difference of level, 37 feet 1 inch, is surmounted by a series of 4 sets of locks, of solid masonry of stone, of the dimensions of 80 feet in length, and 12 in width; and by a canal $2\frac{1}{2}$ miles long, on the margin of which are found inexhaustible supplies of excellent and valuable stone, for building purposes: all which are within the land acquired by the company, in *fee simple*. The quantity of land so possessed here by the company, is 53 acres and 3 roods, at a constant width of 180 feet, and also one acre for the erection of necessary buildings.

The canals at both the Great and Little Falls are excavated of the following dimensions:

25	feet	wide	at	surface,
20	do		bottom,	
4	do	deep.		

2d. Works, erections of walls, and excavations in the body of the river, in order to confine the passages of the water within canals, of widths varying from 16 to 25 feet.

Dams of stone run across the river, leaving openings or sluices of similar width, by which the water was raised in the river above them.

Removals of large stones and masses of rock, which presented obstacles to the passage of boats in the various channels of the river.

Similar to these were works executed on the Monocacy, Antietam, and Conogocheague rivers, and very extensive operations upon the Shenandoah.

Under the improved mode of modern navigation by independent canals, the 2d class of works, erected at enormous expense, at a time when such operations were completely new in the United States, and in the absence of that experience which modern times have derived from the enlargement of scientific research, and the now constant application of practical skill in works of civil engineering, have been found to be entirely useless. And the property, rights, and privileges, of the Potomac Company, in and upon the river Shenandoah, have been by them long since conveyed, for certain considerations, to the Shenandoah Company, who now enjoy the same.

An extract from the appendix annexed to the report of the Committee on the District of Columbia, to the House of Representatives, on the 3d of May, 1822.

“The principal Canals on the Potomac are at the mouth of the Shenandoah, and at the Great and Little Falls.” They afford 15 feet, 76 feet and 9 inches, and 37 feet 6 inches fall, respectively. The canal around the Seneca Falls affords a descent of 7 feet; that at House’s Fall, 3 feet. They may be made to command the entire water of the river, after reserving enough for the purposes of navigation.”

The effect of these expenditures in improving the navigation of the Potomac, may be inferred from the following extract from the report of the Virginia and Maryland Commissioners, printed by order of the Senate of the United States, January 27, 1823 :

The present state of the Navigation.

“It has been stated, and is believed by many persons, that the river Potomac, in its present condition, is navigable nearly half the year. The Potomac Company are required to give a low water navigation, of a foot deep, throughout the year. This circumstance, and the idea entertained of the possibility of confining the waters in the bed of the river to narrow sluices, have confirmed this opinion. The Commissioners have given a minute examination to this branch of the duties imposed upon them, and satisfied themselves, from their own observations, and the most careful inquiries, that no such blessing is enjoyed by the fertile districts through which the river flows.

“The floods and freshets give the only navigation at present used. They occur usually from the 1st September to the 20th June, variously however, in various years. And it so happens, that, although boats are known, in some years, to pass down, through each of the months intervening between these dates, yet, in consequence of the ice, during Winter, and the short continuance of a flood giving navigable water, the average duration of the boating time, in a course of many years, does not much, if at all, exceed eight or ten days passable water for full loaded boats, late in the year, and from twenty-five to thirty-five days in the Spring of the year, making the whole time, when produce and goods can be stream-borne, in the course of one entire common year, from thirty-three to forty-five days. The duration of this period necessarily increases as you approach the Great Falls, and decreases as you ascend to the head of the river. The evils attending the present state of the navigation lessen the benefits which might be supposed to be derived from even this short period. They chiefly consist in its uncertainty, and dependence on the vicissitudes of the seasons; in the great rapidity of the current of the river, in consequence of the great fall or inclination of its plane, in propor-

tion to its length ; in its dangerous character, arising from the wildness of the torrent, and the suddenness of its courses and meanders—having worn its devious way, in the lapse of ages, through countless ridges of rocks and mountains ; and, in consequence of huge fragments of rocks and large loose stones, the remains of the wasted mountains, scattered thickly, and in some places rising over the entire bed of the river, and leaving no passage for loaded boats, impelled by the rapid and impetuous current, but what may be found by warping and winding, with the utmost exertion of strength, agility, and watchfulness, on the part of the crew, through a most irregular course. By these dangers, many boats and cargoes are destroyed. The uncertainty, and the shortness of the duration of the floods, are the very worst features in the character of this navigation. This uncertainty frequently occasions the most ruinous disappointments to the farmers, millers, and merchants. The expected rains are often denied, and the consequence frequently is, that contracts cannot be complied with, which occasion loss and ruin. Sometimes, a small rise, and deceitful appearances, induce a collection of the scattered crews of the boatmen from the mountains, and a general shipment of produce ; by the time they have descended forty or fifty miles down the river, a fall in the water takes place ; the boats are compelled to stop, and their storage, increased expenses, neglect of agents, and natural causes, waste the profits, or damage the produce, of all concerned. This chiefly occurs in the upper part of the river. Sometimes the rains come on sooner than they are expected, and the rise and fall on the river succeed each other before the farmers are prepared to make their shipments ; then the crops lie on hand till next year, subject to all the inconveniences and losses accompanying such circumstances. And when the floods are most propitious, and the navigation is the best, under existing circumstances, the usual consequence is, that the produce of immense districts of country, among the most fertile in the Union, is all forced into market at one time, and a capital, which might be sufficient to give better prices, if the merchant had time to receive the proceeds of one investment before he made a second, is found inadequate to give a fair price, to all, under such disadvantages. Thus, the farmer has frequently no alternative left but to sacrifice the fruits of his year's labor. The expenses are already too great, and produce will bear no additional cost or risk of shipping farther ; and, to carry it home again is impossible : for, sometimes, even the boat which brought it down, cannot be floated back empty. It is surely to be lamented that, wretched as is this navigation, it is the sole dependence of a vast extent of country, which, in spite of its fertility, and the value of its inexhaustible minerals of the most useful kind, is most evidently drooping and suffering, for want of a ready market for its productions, without which stimulus, it is impossible for its agriculture to flourish, or its natural resources to be developed."

No. 3.

An extract from the message of the Governor of Virginia, (ex officio) President of the Board of Public Works, to the House of Delegates, dated December 27th, 1820 :

“The Potomac river, and its connexion with the Ohio.

“The 30th of the 6th month, 1820, I commenced the examination. From the topography of the country it appears that a communication between the Potomac and the Ohio ought to be either by way of Ohio or Youghiogany rivers.

“If the waters of the Youghiogany should be preferred, then a branch called Deep Creek will be most eligible. There are several branches of this creek, which form a junction and compose a stream which may do tolerably well to supply the summit level of a canal. This junction is about two miles west of a low gap in the Alleghany ridge, which has been long spoken of as a suitable point of connexion between the Eastern and Western Waters.

“From this gap the levels were taken both ways. It was found that the fall westward to the point mentioned on Deep Creek was 204.03 feet. The fall eastward to the junction of two branches of Crabtree Run, just above General Swann’s old mill, is 340.90 feet. The distance by estimation rather less than two miles.

“The fall from the last mentioned point to the mouth of Savage river, is 1366.71 feet. The distance not measured, but believed to be about 13 miles.

“It appears then that the waters of Deep Creek are 136.87 feet higher than the water of Crabtree Run at Swann’s old mill, and of course might be brought through by a tunnel, and discharged into the Potomac. In case of a canal navigation the tunnel would be on the summit level, and the water of Deep Creek would supply locks both ways.

“This creek lies in the glades, and the ascent from it towards the ridge but small, for a considerable distance. I think, therefore, that, by driving up an open canal as far as the ground would permit, and then taking the shortest possible distance to the same level on the other side, the tunnel would not exceed two miles in length. I believe a road might be made across the ridge from one point to the other, that is, from Deep Creek to Swann’s mill, at three degrees of descent and elevation that would not exceed five miles in distance.”

[*Engineer’s Report.*

Extract from the report of the Committee of the District of Columbia, of the 3d of May, 1822, upon certain memorials of the inhabitants of Virginia, Maryland; and Pennsylvania, praying the aid of the General Government towards the improvement of the navigation of the river Potomac.

“A hasty survey of the general map of the United States, and a brief recurrence to the theory and policy of the Federal Government,

with their practical illustration by the structure of the Cumberland road, would seem to almost supersede the necessity of any comment, from your committee, on the importance of the navigation of the Potomac, or the power of Congress to provide for its improvement.

One of its southern branches, itself a considerable river, rises to the southwest of Staunton, in Virginia, and is capable of connecting, by a navigable canal, the geographical centre of that State, in territory the largest in the Union, with the market towns of the District of Columbia. Emptying into the Potomac above the chief obstructions of its navigation, the Shenandoah, like those navigable streams which descend from the northwest, through the limestone valleys of Maryland and Pennsylvania, depends for an outlet to the ocean, on the improvement of the navigation of the main river, to a considerable distance above tide water. These branches, when the stem shall have been improved, are capable of affording, with the Potomac, an internal water communication exceeding, in extent, 650 miles.

The value of this navigation to the ample and fruitful territory washed by the tide, or drained by the tributary streams of this noble river, a territory comprehending four counties of Pennsylvania, seven of Maryland, and eighteen of Virginia, exceeding, in extent and population, some of the largest States of the Union, should not be disregarded. It sinks, however, into comparative insignificance, when this river is contemplated as a necessary link of the shortest chain of communication between the Atlantic and Western States. The enlightened policy which seated the Federal Government on the banks of the Potomac, indicates its peculiar adaptation to this purpose; and nature has facilitated its accomplishment, by a rupture of the many ranges of lofty mountains, including even the great ridge of the Alleghany, in the direction which such a purpose requires. It is no longer questionable but that the head waters of the Ohio may be mingled with those of the Potomac, by a tunnel or a subterranean canal, not exceeding two miles in extent; and the produce of the soil and industry of the West, after ascending the Youghiogany, find a safe and commodious channel; thence to the valley of Savage Creek, and through it, the north branch, and the main river, to the Chesapeake and the Atlantic."

Extract from the Report of the Commissioners appointed by the States of Virginia and Maryland to survey the river Potomac, &c., dated December 19th, 1822.

"The territorial feature of the United States, which is most important to all our relations, political, commercial, and social, is the extensive range of mountainous region which divides the rivers falling into the Mississippi from those which fall into the Atlantic Ocean. It forms a wall of separation between the West and East, and the difficulties it presents has diverted the Western commerce from the nearest seaports, and caused its general current to seek distant out-

lets around its Southern and Northern extremities. Such, however, is the wise arrangement of Providence, that, where the evils resulting from this great barrier operate most severely, that is, nearest to its centre, it has placed the remedy within our reach. Of all the rivers which reciprocally drain the lands beyond and on this side the mountains, the Ohio on the one side, and the Potomac on the other, extend their ramifications, of which any use can be made, nearest to the summit and level of the dividing ridge. Such also is the favorable shape of the mountains at this point, where these waters approach nearest, that its flattened surface forms extensive and luxuriant meadows, called glades. A well known operation of the laws of nature, at this elevated point, at all times many degrees cooler than the surrounding air, condenses the vapors and attracts the clouds rising on either side of the mountains, so that these elevated plains or glades, in the driest season, are copiously supplied with water, and afford rich and abundant pasturage, when all the valleys below them are parched with drought. Deep Creek is a Western stream, falling into the Youghiogany, which forms in these glades, and is situated at that point from which the Commissioners commenced their measurement, within two hundred and four feet of the summit of the dividing ridge, and can be brought, by a cut, within two miles of a branch of Savage river, called Crabtree Run, at the junction of its branches at Swan's old Mill, on this side of the mountains. Deep Creek is a copious stream, with the banks nearly perpendicular, running through the soft earth of the glades, and was, in the season when they examined it, (supposed to be the driest which has occurred within the memory of most men living) from three to four feet deep, and from nine to twelve feet wide, with a current of about one and an half miles to the hour. There is a narrow pass in a ridge of the glades, through which Deep Creek makes its way; where, by erecting a dam, fifteen or twenty feet high, and not more than forty or fifty yards long, these meadows may be inundated, and an immense pond may be formed, equal at least to three or miles in length, and half a mile in breadth. This reservoir, it is believed, would furnish sufficient water for locks and a canal, if carried through the dividing ridge by a tunnel, two miles long, to descend and ascend both sides of the mountains, to the Monongahela on the west, and to Savage river on the east, especially when recruited, as you descended by Big Youghiogany, on the West side, and by Crabtree Run on the east side, respectively. The fact was not ascertained, but from the position of the sources of Little Youghiogany, it is believed they might easily be conveyed into the same reservoir."

Extract from the President's Message to Congress, at the commencement of the Session, Dec. 3, 1823.

"Many patriotic and enlightened citizens, who have made the subject an object of particular investigation, have suggested an improvement of still greater importance. They are of opinion that the waters

of the Chesapeake and Ohio may be connected together by one continued canal, and at an expense far short of the value and importance of the object to be obtained. If this could be accomplished, it is impossible to calculate the beneficial consequences which would result from it. A great portion of the produce of the very fertile country through which it would pass, would find a market through that channel. Troops might be moved with great facility in war, with cannon, and every kind of munition, and in either direction. Connecting the Atlantic with the Western country, in a line passing through the Seat of the National Government, it would contribute essentially to strengthen the bond of union itself. Believing, as I do, that Congress possess the right to appropriate money for such a national object, (the jurisdiction remaining to the States through which the canal would pass,) I submit it to your consideration whether it may not be advisable to authorize, by an adequate appropriation, the employment of a suitable number of the officers of the Corps of Engineers, to examine the unexplored ground, during the next season, and to report their opinion thereon. It will likewise be proper to extend their examination to the several routes through which the waters of the Ohio may be connected, by canals, with those of Lake Erie."

Extract from a Message from the President of the United States, of the 14th of February, 1825, transmitting to the House of Representatives a report of the United States' Board of Internal Improvement, to the Chief of the Engineer Corps.

"In execution of the orders of the Secretary of War, communicated in your letter of the 31st May last, "to make a reconnoissance of the country between the waters of the Potomac and the head of steam boat navigation of the Ohio, and between the Ohio and Lake Erie, for the purpose of ascertaining the practicability of a communication between these points; of designating the most suitable route for the same; and of forming plans and estimates, in detail, of the expense of execution:" the Board proceeded from the Seat of Government, through the portion of country indicated therein. Having deliberately examined every local circumstance on that part of the Alleghany mountain which lies between the head waters of the Potomac and those of the Youghiogany, a branch of the Monongahela, the Board prepared instructions for the preliminary surveys and measurements to be executed by the Topographical Engineers and other officers and gentlemen attached for this service; and having now maturely considered the circumstances observed by them personally, and carefully studied the results of such of these preliminary surveys as are completed, *they are decidedly of opinion that the communication is practicable.*

The Board, on viewing the country between the Ohio and Lake Erie, along various lines indicated by public opinion, became possess-

ed of such facts as place the practicability of canalling, from the head of steamboat navigation, in the Ohio, to Lake Erie, beyond all doubt. The information collected by the Board is not, however, of a nature to enable them to decide which of the several routes deserves a preference; and a definitive choice can only be made after the several surveys, indicated by the extract from the record of the Board, herewith, shall have been executed."

Further extracts from the same report.

"On the whole, the western section of the canal, from the mouth of Bear Creek to that of the Monongahela, at Pittsburg, offers no obstacles which may not be surmounted at a reasonable expense; and the waters of the Youghiogany, Bear Creek, and Casselman's river, are amply sufficient to feed it. Large reservoirs may be formed in Bear Creek and Casselman's river, by throwing dams across them, and on the route from Casselman's to the Paper Mills, and at the mouth of the Youghiogany in the Monongahela. The practicability of this section is out of question.

Its length will be about 100 miles, and its descent from Bear creek to Pittsburg 584½ feet, as Pittsburg is 756 feet above the level of the ocean.

The investigation of the topography and water courses of the country through which the Chesapeake and Ohio Canal should run, and the results of our preparatory surveys, obtained up to the present moment, demonstrate that this noble enterprise is practicable; and, although we have not yet sufficient data to calculate the expense of the work, there is every probability that it will not bear any comparison with the political, commercial, and military advantages which it will procure to the Union."

No. 4.

ACT OF THE STATE OF VIRGINIA.

An act incorporating the Chesapeake and Ohio Canal Company.—[Passed January 27, 1824.]

Whereas a navigable canal from the tide water of the river Potomac, in the District of Columbia, to the mouth of Savage Creek, on the north branch of said river, and extending thence, across the Alleghany mountain, to some convenient point of the navigable waters of the river Ohio, or some one of its tributary streams, to be fed through its course, on the east side of the mountain, by the river Potomac and the streams which empty therein, and on the western side of the mountain, and in passing over the same, by all such streams of water as may be beneficially drawn thereto by feeders, dams, or any other

practicable mode, will be a work of great profit and advantage to the people of this State, and of the neighboring States, and may ultimately tend to establish a connected navigation between the eastern and western waters, so as to extend and multiply the means and facilities of internal commerce, and personal intercourse between the two great sections of the United States, and to interweave more closely all the mutual interests and affections that are calculated to consolidate and perpetuate the vital principles of Union; and whereas it is represented to this General Assembly, that the Potomac Company are willing and desirous that a charter shall be granted to a new company upon the terms and conditions hereinafter expressed; and that the charter of the present company shall cease and determine:

Be it therefore enacted by the General Assembly of Virginia, That, as soon as the Legislatures of Maryland and Pennsylvania, and the Congress of the United States, shall assent to the provisions of this act, and the Potomac Company shall have signified their assent to the same, by their corporate act, a copy whereof shall be delivered to the Executives of the several States aforesaid, and to the Secretary of the Treasury of the United States, there shall be appointed by the said Executives and the President of the United States, three commissioners on the part of each State, and the Government of the United States, any one of whom shall be competent to act for his respective Government. The said commissioners shall cause books to be opened at such times and places as they shall think fit, in their respective States, and the District of Columbia, under the management of such persons as they shall appoint, for receiving subscriptions to the capital stock of the company hereinafter incorporated; which subscriptions may be made, either in person or by power of attorney; and notice shall be given in such manner as may be deemed advisable, by one or more of the said commissioners, of the time and places of opening the books.

2. And the said commissioners shall cause the books to be kept open at least forty days. And, within twenty days after the expiration thereof, shall call a general meeting of the subscribers at the city of Washington, of which meeting notice shall be given, by a majority of the commissioners aforesaid, in at least four of the newspapers printed in Pennsylvania, Maryland, Virginia, and the District of Columbia, at least twenty days next before the said meeting, and such meeting shall and may be continued from day to day until the business is finished; and the commissioners, at the time and place aforesaid, shall lay before such of the subscribers as shall meet according to the said notice, the book containing the state of the said subscriptions; and if one-fourth of the capital sum of six million of dollars should appear not to have been subscribed, then the said commissioners, or a majority of them, at the said meeting, are empowered to take and receive subscriptions to make up such deficiency, and may continue to take and receive such subscription for the term of twelve months thereafter; and a just and true list of all the subscribers, with the sum subscribed by each, shall be made out, and returned by the

said commissioners, or by a majority of them, under their hands to the Board of Public Works, of this State, to the Governor and Council of the State of Maryland, to the Secretary of State of the State of Pennsylvania, and to the Secretary of the Treasury of the United States, to be carefully preserved ; and in case more than six millions of dollars shall be subscribed, then the sum subscribed shall be reduced to that amount, by the said commissioners, or a majority of them, by beginning at and striking off a share from the largest subscription or subscriptions, and continuing to strike off a share from all subscriptions under the largest, and above one share, until the same is reduced to the capital aforesaid, or until a share is taken from all subscriptions above one share ; and lots shall be drawn between subscribers of equal sums, to determine the number of shares which each subscriber shall be allowed to hold, on a list to be made for striking off as aforesaid ; and if the sum subscribed still exceed the capital aforesaid, then to strike off, by the same rule, until the sum subscribed is reduced to the capital aforesaid, or all the subscriptions reduced to one share respectively ; and, if there still be an excess, then lots shall be drawn to determine the subscribers who are to be excluded, in order to reduce the subscription to the capital aforesaid : which striking off shall be certified on the lists aforesaid ; and the said capital stock of the company hereby incorporated, shall consist of six millions of dollars, divided into sixty thousand shares, of one hundred dollars each : of which every person subscribing may take and subscribe for one or more whole shares ; and such subscriptions may be paid and discharged either in the legal currency of the United States, or in the certificates of stock of the present Potomac Company, at the par or nominal value thereof, or in the claims of the creditors of the said Company, certified by the acting President and Directors to have been due, for principal and debt, on the day on which the assent of the said Company shall have been signified by their corporate act, as hereinbefore required : *Provided*, That the said certificates of stock shall not exceed, in the whole amount, the sum of three hundred and eleven thousand one hundred and eleven dollars and eleven cents ; nor the said claims the sum of one hundred and seventy-five thousand eight hundred dollars ; *Provided, also*, That the stock so paid for in certificates of the stock of the present Company, and of the debts due from the said Company, shall be entitled to dividend, only as hereinafter provided : and that no payment shall be received, in such certificates of stock, until the Potomac Company shall have executed the conveyance prescribed by the thirteenth section of this act : *And, provided*, That, unless one-fourth of the said capital shall be subscribed, as aforesaid, all subscriptions made in consequence of this act shall be void ; and, in case one-fourth, and less than the whole capital, shall be subscribed as aforesaid, then the said commissioners, or a majority of them, are hereby empowered and directed to take and receive the subscriptions, which shall first be offered in whole shares, as aforesaid, until the deficiency shall be made up ; a certificate of which additional subscription shall be made, under the hands of said commis-

sioners, or a majority of them, for the time being, and returned as aforesaid.

3. *And be it further enacted*, That, whenever one-fourth, or a greater part of the said stock shall have been subscribed, in the manner aforesaid, then the subscribers, their heirs, and assigns, shall be, and are hereby declared to be, incorporated into a company, by the name of the "Chesapeake and Ohio Canal Company." and may sue, and be sued, and, as such, shall have perpetual succession, and a common seal; and the estates, rights, and interests, of the said Company, shall be adjudged and taken in law to be real estate; and it shall, thereupon, be the duty of the said commissioners, or a majority of them, to call a general meeting of the said subscribers, at such time and place, as they, or a majority of them, shall appoint, after advertising the same in such public prints as they, or a majority of them, may think proper; and such of the said subscribers as shall be present at the said meeting, or a majority of them, are hereby empowered and required to elect a President and six Directors, for conducting the said undertaking, and managing all the said Company's business and concerns, for and during such time, not exceeding three years, as the said subscribers, or a majority of them, shall think fit; and, in counting the votes of all general meetings of the said Company, each member shall be allowed one vote for every share, as far as ten shares, and one vote for every five shares above ten, by him or her held at the time, in the stock of the said Company; and any proprietor, by writing under his or her hand, executed before two witnesses, may depute any other member or proprietor to vote and act as proxy for him or her, at any general meeting: *Provided, also*, That no officer nor director of said Company shall, under any circumstances, be allowed to vote on any stock but his own.

4. *And be it further enacted*, That the said president and directors, and their successors, or a majority of them, assembled, shall have full power and authority to appoint, and, at their pleasure, dismiss, such engineer or engineers, and agent or agents, as they may deem expedient, and to fix their compensation; and to agree with any person or persons, on behalf of the said Company, to cut canals, erect dams, open feeders, construct locks, and perform such other works, as they shall judge necessary or expedient for completing the canal hereinbefore mentioned and described; and, out of the money arising from the subscriptions and tolls, and other aids, hereinafter given, to pay for the same, and to repair and keep in order the said canals, locks, and other works necessary thereto, and to defray all incidental charges; and also to appoint a treasurer, clerk, and other officers, toll-gatherers, managers, and servants, as they shall judge requisite, and to agree for, and settle, their respective wages or allowances; and to settle, pass, and sign their accounts; and also to make and establish rules of proceeding, and to transact all other business and concerns of the said Company, in and during the intervals between the general meetings of the same; and they shall be allowed, as a compensation for their trouble therein, such sum of money as shall, by a

general meeting of the stockholders, be determined : *Provided, always,* That the treasurer shall give bond, in such penalty, and with such security, as the said president and directors, or a majority of them, shall direct, for the true and faithful discharge of the trust reposed in him ; and that the allowance to be made him for his services, shall not exceed three dollars in the hundred for the disbursements by him made ; and that no officer in the Company shall have any vote in the settlement or passing of his own account.

5. *And be it further enacted,* That, on all subscriptions which shall not be paid, as hereinbefore provided, in the certificates of the stock, or debts of the present Potomac Company, there shall be paid, at the time of subscription, on each share one dollar ; and thereafter when the company shall be formed, the stock subscribed shall be paid on such instalments, and at such times, as the president and directors shall, from time to time, require, as the work advances : *Provided,* That not more than one-third part shall be demanded within any year from the commencement of the work : *nor any payment demanded, within any year from the commencement of the work ;** nor any payment demanded, un'il at least sixty days' public notice thereof shall have been given, in such public newspapers as the said president and directors shall direct such notices to be published in ; and, whenever any subscriber shall fail to pay any instalment, called for by the company, it shall and may be lawful for the company, upon motion to be made in any court of record, after ten days' notice, to obtain judgment against the subscriber so failing to pay ; or the said company, at their option, may, after giving sixty days' notice, in such public newspaper, printed within the District of Columbia, as they may judge proper, sell the stock of such subscriber ; and, if the proceeds of any such sale shall exceed the sum demanded, the surplus, after paying the expenses of such sale, shall be paid to the subscriber so failing, or to his legal representatives ; and the purchaser, at such sale, shall become a stockholder, and be subject to the same rules and regulations, and entitled to the same privileges, rights, and emoluments, as original subscribers under this act.

6. And to continue the succession of the said president and directors, and keep up the same number : *Be it enacted,* That, from time to time, upon the expiration of the said term for which the said president and directors were appointed, the stockholders of the said company, at the next general meeting, shall either continue the said president and directors, or any of them, or choose others in their stead, and, until such choice be made, the president and directors for the time being, shall continue in office ; and in case of the death, removal, resignation, or incapacity, of the president, or any of the said directors, may and shall, in manner aforesaid, elect any other person or persons to be president and directors, in the room of him or them so dying, removing, or resigning ; and may, at any of their general

* The preceding clause, in italics, has been evidently inserted and retained through inadvertence in engrossing the original bill. Judicial construction, it is believed, will afford for the error an adequate corre

meetings, remove the president or any of the directors, and appoint others for and during the remainder of the term for which such person or persons were at first to have acted.

7. *And be it enacted*, That every president and director, before he acts as such, shall take an oath or affirmation for the due execution of his office.

8. *And be it enacted*, That the presence of stockholders, having a major part of the stock at least, shall be necessary to constitute a general meeting of the stockholders, which shall be held on the first Monday in June in every year, at such convenient town or place as shall be, from time to time, appointed by the said general meeting; but, if a sufficient number shall not attend on that day, the stockholders who do attend, may adjourn from time to time, until the stockholders holding the major part of the stock do attend, and the business of the company is finished; to which meeting the president and directors shall make report, and render distinct accounts of all their proceedings; and, on finding them fairly and justly stated, the stockholders then present, or a majority of them, shall give a certificate thereof, a duplicate of which shall be entered on the company's books; and at such yearly general meetings, after leaving in the hands of the treasurer such sums as the stockholders, or a majority of them, shall judge necessary for repairs and contingent charges, an equal dividend of all the nett profits arising from the tolls hereby granted, shall be ordered and made to and among all the stockholders of the said company, in proportion to their several shares, subject to the provisions and enactments hereinafter declared; and, upon any emergency in the interval between the said yearly meetings, the said president, or a majority of the said directors, may appoint a general meeting of the stockholders of the company, at any convenient town or place, giving at least one month's previous notice, in at least four of the newspapers in Pennsylvania, Maryland, Virginia, and the District of Columbia; which meeting may be adjourned and continued as aforesaid; and in case the stockholders, or a majority of them, in any general meeting aforesaid, shall deem it expedient to order a semi-annual, rather than a yearly dividend as aforesaid, then, in like manner, with like notice, and under like restrictions, there shall be a half-yearly, or semi-annual dividend of nett profits declared and paid.

9. *And be it enacted*, That, for and in consideration of the expenses the said stockholders will be at, not only in cutting the said canal, erecting locks and dams, providing aqueducts, feeders, and other works, and in improving and keeping the same in repair, the said canal and all other works aforesaid, or required to improve the navigation thereof, at any time hereafter, with all their profits, subject to the limitations herein provided, and to none other, shall be, and the same are hereby, vested in the said stockholders, their heirs and assigns, forever, as tenants in common, in proportion to their respective shares, and be forever exempt from the payment of any tax, imposition, or assessment, whatsoever, and that it shall and may be lawful for the said president and directors, at all times, forever hereafter, to de-

mand and receive, at such places as shall hereafter be appointed by the president and directors aforesaid, tolls for the passage of vessels, boats, rafts, produce, and all other articles, at such rates as the said president and directors may hereafter allow and establish, according to the provisions of this act.

10. *And be it enacted*, That, if the commissioners hereby required to be appointed shall die, resign, or refuse to act, the vacancy occasioned thereby shall be filled by the same authority by which the original appointment was made; and the person or persons appointed to fill such vacancy shall have all the power and authority which was vested in the commissioner whose place he or they shall be appointed to supply; and, when any part of the canal aforesaid shall have been completed, according to the true intent and meaning of this act, the president and directors of the company hereby created shall have power, and it shall be their duty to ordain and establish a rate of tolls to be paid upon boats, vessels, rafts, or other property, passing on the part of the canal so completed, and so, from time to time, as part or parts shall be completed; and until the eastern section thereof shall be finished up to the mouth of Savage river or creek; and, thereafter, until the entire canal shall have been finished according to the true intent and meaning of this act. For the collection of which tolls, the president and directors shall have power to establish so many toll houses, and, at their pleasure, to appoint and remove so many collectors, and at such places as from time to time they may judge expedient; and the said president and directors shall have full authority, subject to the direction and control of a majority, in interest, of the stockholders represented in any general meeting, to regulate and fix a tariff of tolls, not exceeding an average of two cents per ton per mile; and so to adjust the said tolls, in relation to the capacity or burthen of the boats, and the dimensions of the rafts passing the locks of the said canal, as to promote economy of water and time in the navigation thereof.

11. *And be it enacted*, That the president and directors shall, annually, or semi-annually, declare and make such dividend of the nett profits, from the tolls to be received according to the provisions of this act, and from the other resources of the company, as they may deem advisable, after deducting therefrom the necessary current, and the probable contingent expenses, to be divided among the proprietors of the stock of the said company, in proportion to their respective shares, in manner following, that is to say: if such nett profits shall not exceed ten per cent. on the amount of shares, which shall have been paid for in the current money of the United States, and expended on the eastern section of the said canal, then the whole thereof shall be divided among the holders of such shares, in proportion to their respective shares; but, if such nett profits shall exceed the rate of ten per cent. per annum in any year, on such amount of stock, then the surplus shall be divided among such stockholders as shall have paid for their shares in certificates of the debts of the Potomac Company, until they shall therefrom have received a dividend of six per cent.; and, if

a surplus yet remain, the same shall be divided among the stockholders who shall have paid for their shares in certificates of the stock of the Potomac Company, until they shall have received therefrom a dividend of six per cent. per annum on such shares; and, if a surplus still remain, so long as the western section of the canal shall remain unfinished, such surplus shall be applied, from time to time, to the construction and completion thereof, in such mode as the president and directors, under such rules and regulations, not inconsistent with the Constitution of the United States, or of the several States aforesaid, as the stockholders, or a majority thereof, in general meeting, may prescribe, until the western section of the canal shall be also completed: after which, if such surplus shall still arise, the same shall be divided among all the stockholders, without discrimination, in proportion to their respective shares, until the annual dividend thereon shall have reached fifteen per cent. beyond which it shall never extend. But should the nett revenue of the company exceed that amount for any two years in succession, then such excess shall be applied, by the president and directors, in such mode as shall be agreed on by a majority of the stockholders convened in general meeting: first, to strengthening and improving the works of the canal of every description requiring the same; next, to the accommodation, where not already provided, of the inhabitants of the shores of the river Potomac, and of the country drained by the tributary streams thereof, now navigable, or which may hereafter become so, by affording to them, in the best practicable mode, a safe and easy access to the canal, from the surface of the main river, and of the said streams emptying therein; and, last of all, to the erection of such walls of stone or other materials, along the water margin of the canal, as shall fit the same for the navigation of steam boats of a size adapted to the said canal. And should the said tolls continue, after all such improvements have been completed, to nett more than fifteen per cent. per annum to the stockholders, for any two years in succession, the tolls upon the same shall be reduced, by the president and directors, according to some just and equitable ratio, till the said dividend shall fall to fifteen per cent. per annum: *Provided*, That, should the said dividend thereafter sink below fifteen per cent. the said tolls, or a part thereof, may be renewed, till the said nett dividend reaches that amount. And for any, or all the within mentioned purposes, the said president and directors are empowered to borrow, in behalf of the company, on the credit of such excess of the tolls, such sum or sums of money as they may deem expedient, at such rate of interest, and with such delay of payment, as they may stipulate, with the previous consent of a majority of the stockholders in general meeting convened.

12. *And be it further enacted*, That it shall be the duty of the President and Directors of the Chesapeake and Ohio Canal Company, so long as there shall be and remain any creditor of the Potomac Company, who shall not have vested his demand against the same in the stock of the Chesapeake and Ohio Canal Company, to pay to such creditor or creditors, annually, such dividend, or proportion of the

nett amount of the revenues of the Potomac Company, on an average of the last five years preceding the organization of the said proposed company, as the demand of the said creditor or creditors at this time, may bear to the whole debt of one hundred and seventy-five thousand eight hundred dollars.

13. *And be it further enacted*, That, whenever the Potomac Company shall have declared its assent to the provisions of this act, in the manner hereinbefore provided, it shall be lawful for the said company to surrender its charter, and convey, in due form of law, to the Chesapeake and Ohio Canal Company, hereby incorporated, all the property, rights, and privileges, by them owned, possessed, and enjoyed, under the same; and thereupon it shall be lawful to and for the said company, hereby proposed to be created, to accept such surrender and transfer, and to hold, possess, use, and occupy, all the said property, rights, and privileges, in the same manner, and to the same effect, as the said Potomac Company now hold, possess, and occupy the same by law; and thereupon the charter of the said Potomac Company shall be, and the same is hereby, vacated and annulled, and all the rights and powers thereby granted to the Potomac Company, shall be vested in the company hereby incorporated; and it shall be the duty of the said last mentioned company, until every section of the contemplated canal shall be completed, so as to be used and enjoyed for the purposes of navigation, to keep the corresponding part of the river in a proper state for navigation, and in good order as the same now is; and, in default thereof, they shall be in all things responsible, in the same manner as the Potomac Company is now responsible. And in all rivulets, streams, creeks, and rivers, required for the western section of the said Chesapeake and Ohio Canal, the same rights shall be, and are hereby, vested in the Chesapeake and Ohio Company, by this act, as the charter of the Potomac Company vested in the said company, in relation to the waters of the Potomac, and the tributary streams thereof.

14. *And be it enacted*, That the said canal, and the works to be erected thereon in virtue of this act, when completed, shall forever thereafter be esteemed and taken to be navigable as a public highway, free for the transportation of all goods, commodities, and produce, whatever, on payment of the tolls to be imposed, as provided by this act; and no other toll or tax whatever, for the use of the said canal and the works thereon erected, shall, at any time hereafter, be imposed, but by consent of the said States, and of the United States.

15. And whereas it is necessary for the making of the said canal, locks, dams, ponds, feeders, and other works, that a provision should be made for condemning a quantity of land for the purpose: *Be it enacted*, That it shall and may be lawful for the said president and directors, or a majority of them, to agree with the owners of any land, through which the said canal is intended to pass, for the purchase or use and occupation thereof; and, in case of disagreement, or in case the owner thereof shall be a femme covert, under age, non compos, or out of the State or county, on application to a justice of the county in which

such land shall be, the said justice of the peace shall issue his warrant, under his hand, to the sheriff of the county, to summon a jury of eighteen inhabitants of his county, not related to the parties, nor in any manner interested, to meet on the land to be valued at a day to be expressed in the warrant, not less than ten, nor more than twenty days thereafter; and the sheriff, upon receiving the said warrant, shall forthwith summon the said jury, and, when met, shall administer an oath or affirmation to every jurymen who shall appear, being not less than twelve in number, that he will faithfully, justly, and impartially, value the land, and all damages the owner thereof shall sustain by cutting the canal through such land, or the partial or temporary appropriation, use, or occupation, of such land, according to the best of his skill and judgment; and that, in such valuation, he will not spare any person for favor or affection, nor any person grieve for malice, hatred, or ill-will; and, in every such valuation and assessment of damages, the jury shall be, and they are hereby instructed to consider, in determining and fixing the amount thereof, the actual benefit which will accrue to the owner from conducting the said canal through, or erecting any of the said works upon, his land, and to regulate their verdict thereby; except that no assessment shall require any such owner to pay, or contribute any thing to the said company where such benefit shall exceed, in the estimate of the jury, the value and damages ascertained as aforesaid; and the inquisition thereupon taken, shall be signed by the sheriff and some twelve or more of the jury, and returned by the sheriff to the clerk or prothonotary of his county; and, unless good cause be shown against the said inquisition, it shall be affirmed by the court, and recorded; but, if the said inquisition should be set aside, or if, from any cause, no inquisition shall be returned to said court within a reasonable time, the said court may, at its discretion, as often as may be necessary, direct another inquisition to be taken in the manner above prescribed; and, upon every such valuation, the jury is hereby directed to describe and ascertain the bounds of the land by them valued, and the quality and duration of the interest and estate in the same, required by the said company for its use; and their valuation shall be conclusive on all persons, and shall be paid for by the said president and directors, to the owner of the land, or his legal representatives; and, on payment thereof, the said company shall be seized of such land as of an absolute estate in perpetuity, or with such less quantity and duration of interest or estate in the same, or subject to such partial or temporary appropriation, use, or occupation, as shall be required and described, as aforesaid, as if conveyed by the owner to them. And whenever, in the construction of the said canal, or any of the works thereof, locks, dams, ponds, feeders, tunnels, aqueducts, culverts, bridges, or works of any other description whatsoever, appurtenant thereto, it shall be necessary to use earth, timber, stone, or gravel, or any other material to be found on any of the lands adjacent, or near thereto, and the said president and directors, or their agent, cannot procure the same for the works aforesaid, by private contract of the proprietor or

owner, or in case the owner should be a femme covert, or non compos, or under age, or out of the State or county, the same proceedings, in all respects, shall be had as in the case before mentioned of the assessment and condemnation of the lands required for the said canal, or the works appurtenant thereto.

16. *And be it enacted*, That it shall be the duty of the company hereby incorporated, to cut, make, and construct the said canal, with good and sufficient locks, on the most approved plan for expedition in the use thereof, and with a width of not less than forty feet at the surface of the water therein, or of twenty-eight feet at the bottom thereof, unless the quality of the soil shall require a narrow base to admit of a sufficient slope to preserve the banks from sliding down, and sufficient to admit, at all seasons, the navigation of boats and rafts, with a depth of four feet water at the least; and wherever wastes shall be essential to the security of the said canal, and in no other situation whatever, along the same, the waste water of the said canal may be, from time to time, sold or disposed of by the said company, for the purpose of supplying such works and machinery as require a water power. And along one side at least of the said canal, and such aqueducts as it may render necessary, there shall be provided throughout its whole extent, a towing path of sufficient breadth to apply the power of horses to the navigation thereof.

17. *And be it enacted*, That it shall and may be lawful for any of the said stockholders to transfer his or her shares, by deed executed before two witnesses, and registered, after the proof of the execution thereof, in the company's books, and not otherwise, except by devise, which devise shall also be exhibited to the president and directors, and registered in the company's books before the devisee or devisees shall be entitled to draw any part of the profits from the said tolls or dividends: *Provided*, That no transfer shall be made, except for one or more whole share or shares, and not for part of such share or shares; and that no share or shares shall, at any time, be sold, conveyed, or held in trust for the use and benefit, or in the name of another, whereby the said president and directors, or the stockholders of the said company, or any of them, shall or may be challenged, or made to answer concerning any such trust; but that every person appearing as aforesaid to be a stockholder, shall, as to the others of the said company, be, to every intent, taken absolutely as such; but as between any trustee and the person for whose benefit any trust shall be created, the common remedy may be pursued.

18. *And be it enacted*, That, if the said capital, and the other aids already granted by this act, shall prove insufficient, it shall and may be lawful for the said company, from time to time, to increase the said capital by the addition of so many whole shares as shall be judged necessary by the said stockholders, or a majority of them, present at any general meeting of the said company; and the said president and directors, or a majority of them, are hereby empowered and required, after giving at least two months' previous notice thereof, in at least four of the newspapers printed in Virginia, Pennsylvania,

Maryland, and the District of Columbia, to open books in the before-mentioned States and District, for receiving and entering such additional subscriptions, in which the stockholders of the said company for the time being, shall, and are hereby declared to have the preference of all others, for the first thirty days after the said books shall be opened as aforesaid, of taking and subscribing for so many whole shares, as any of them shall choose ; and the said president and directors are hereby required to observe, in all other respects, the same rules therein, as are by this act prescribed for receiving and adjusting the first subscriptions, and in like manner to return, under the hands of any three or more of them, an exact list of such additional subscriptions, with the sums subscribed, to the public authorities, as aforesaid, to be, by them, preserved as aforesaid ; and all stockholders of such additional shares shall, and are hereby declared to be, from thenceforward, incorporated into the said company.

19. *And be it enacted*, That, whenever it shall become necessary to subject the lands of any individual to the purposes provided for in this act, and their consent cannot be obtained, it shall and may be lawful for the company to enter upon such lands, and proceed to the execution of such works, as may be requisite ; and that the pendency of any proceedings in any suit in the nature of a writ of *ad quod damnum*, or any other proceedings, shall not hinder or delay the progress of the work ; and it shall be the duty of every court to give precedence to controversies which may arise between the company created by this act, and the proprietors of land sought to be condemned for public uses, and to determine them in preference to all other causes.

20. *And be it enacted*, That the said canal shall be, and the same is hereby, divided into two sections, to be denominated first and second, or eastern and western, respectively ; that the first, or eastern section, shall begin at the District of Columbia, on tide water, and terminate at or near the bank of Savage river, or creek, which empties into the north branch of the Potomac, at the base of the Alleghany mountain ; that the second, or western section, shall commence at the said termination, and extend along the valley of Savage river, or creek, so far as the same, or any branch thereof, as may reach some convenient point thereon, for connecting the eastern and western waters, by a tunnel through, or an open cut across, the dividing ridge between the same ; and thence, after crossing the said dividing ridge, shall proceed to the highest steamboat navigation of the Ohio river, or of some one tributary stream thereof, in such direction as, in the opinion of the said president and directors, shall be best calculated for the attainment of the end set forth in the preamble of this act : that the said president and directors shall first construct the eastern section aforesaid, out of the capital stock hereinbefore mentioned, and shall next proceed to construct, with all possible despatch, the western section thereof. In case the said company shall not begin the said work within two years after the company shall have been formed, or if the work, having been so begun, shall not be diligently prosecuted, so that one hundred miles of the said canal, with the adequate locks and incident-

tal improvements, shall not be completed, and in fit order for navigation, in the term of five years from the commencement of the work, then all interest of the said company in the navigation and tolls shall cease and determine, and their charter shall be thereafter taken to be null and void; and so, in like manner, shall the said charter be null and void, if the entire eastern section be not completed in the term of twelve years from the said commencement. And should the said company fail to begin the western section of the said canal in two years after the time allowed as aforesaid for the completion of the eastern section; or, having begun the western section, shall fail to complete the same in six years after such beginning, then all right, title, and interest, of the said company, in the said western section, shall cease and determine; and the several States aforesaid shall have full authority to incorporate another company for the completion of such section, or to complete the same in any other mode that they may deem expedient. And if, after the completion of the said canal and locks, the president and directors shall fail to keep the same in repair for twelve months at any time, then, in like manner, the interest of the company in the navigation and tolls shall cease, and their charter shall be forfeited.

21. *And be it further enacted*, That the right to the waters of the river Potomac, for the purpose of any lateral canal or canals, which the State of Virginia or Maryland may authorize to be made in connection with the said canal, is reserved to the said States respectively; that a similar right is reserved to the State of Pennsylvania, in relation to the rivers and streams within the territory of that State, the waters of which may be used in supplying the western section of the said canal; that the Government of the United States shall retain the power to extend the said canal in or through the District of Columbia, on either or both sides of the river Potomac: *Provided*, That, before this act shall take effect, the Congress of the United States shall authorize the States of Virginia and Maryland, or either of them, to take and continue a canal from any point of the above named canal, or the termination thereof, through the territory of the District of Columbia, or any part thereof, to the territory of the said States, or either of them, in any direction they may deem proper, upon the same terms and conditions, and with all the rights, privileges, and powers, of every kind whatsoever, that the company incorporated by this act have to make the Chesapeake and Ohio canal. *And provided, also*, That, in taking or extending such lateral canal or canals through the District of Columbia, by either of the said States, no impediment or injury be done to the navigation of the said Chesapeake and Ohio canal.

22. This act, or so much thereof as respects the Canal and works designed to be constructed in the District of Columbia, and the States of Virginia and Maryland, shall take effect, with such necessary modification in the construction thereof, as shall fit it for such limited application or use, upon the assent of the Congress of the United States, and the Legislature of Maryland being given thereto; and

upon its receiving the further assent of the Legislature of Pennsylvania, the whole and every section and part thereof shall be valid and in full force and operation.

23. *Be it further enacted*, That the assent of the Congress of the United States, required by the first section of this act, and the authority conferred by the fourteenth section, is understood and taken to relate only to their authority as the Legislature of the District of Columbia.

24. *Be it further enacted*, That all acts, and part of acts, coming within the purview of this act, shall be, and the same are hereby, repealed.

RICHMOND, *December 30, 1824.*

The foregoing is a true copy of an Act of the General Assembly of Virginia.

WM. MUNFORD, *Keeper of the Rolls.*

No. 5.

ACT OF THE STATE OF MARYLAND.

AN ACT to confirm an Act of the General Assembly of the State of Virginia, entitled "An Act incorporating the Chesapeake and Ohio Canal Company."

Whereas the General Assembly of Virginia have heretofore, at the December session of the said General Assembly, in the year eighteen hundred and twenty-three, passed an act, entitled "An act incorporating the Chesapeake and Ohio Canal Company." in the substance, or words following :

[*See the preceding Act.*]

Therefore, be it enacted by the General Assembly of Maryland, That the said act of the General Assembly of Virginia be, and the same is hereby, accepted, assented to, and confirmed.

And be it further enacted and declared, That, by confirming and accepting the act of Virginia, it is not intended by the Legislature of Maryland to deny to the Congress of the United States the constitutional power to legislate on the subjects of roads and canals. And for the purpose of removing all doubt as to the right of the State of Maryland to intersect the said Chesapeake and Ohio Canal, for the purpose of conducting a lateral canal or canals to Baltimore, or elsewhere in the State of Maryland, from that part of the said Chesapeake and Ohio Canal which shall be within the District of Columbia—

Be it further enacted and declared, That the said act of Virginia has been accepted and confirmed by the Legislature of Maryland, on the express condition that the act of Congress contemplated by the twen-

ty-first section of the Virginia act, shall direct and provide some safe and practicable mode whereby such lateral canal or canals may be secured to the State of Maryland, and whereby, also, it may be determined whether such lateral canal or canals will injure the said Chesapeake and Ohio Canal, within the meaning and intention of the said twenty-first section of the Virginia act.

We hereby certify, that the foregoing is a true copy of the original act, as passed both branches of the Legislature, at December session, eighteen hundred and twenty-four.

WM. KILTY, *Clk. Senate of Md.*
JOHN BREWER, *Clk. House Del.*

Annapolis, Jan. 31, 1825.

Extracts from the Act of the State of Maryland, for the promotion of Internal Improvement, passed March 8, 1826.

“SEC. 19. *And be it enacted*, That the Treasurer of the Western Shore be, and he is hereby, authorized and required, for and on behalf of the State, to subscribe to the Chesapeake and Ohio Canal Company for stock to the whole amount of the stock of the Potomac Company owned by the State, and of the debt due to the State by the said Potomac Company, and to pay for the same in the certificates of the stock of the Potomac Company, and in the evidences of the debt due to the State, certified in the manner specified in the charter of the said Chesapeake and Ohio Canal Company; and also to subscribe for five thousand shares of the stock of the said company, payable, agreeably to the terms of the charter, in the legal currency of the United States.

SEC. 20. *And be it enacted*, That the Treasurer of the Western Shore be, and he is hereby, instructed and required, in like manner, to subscribe for five thousand shares in the Maryland Canal Company hereby incorporated.

SEC. 21. *And be it enacted*, That the sum of two hundred thousand dollars shall be, and the same is hereby, appropriated, or such part thereof as may be necessary to drain, embank, and render dry and arable, the low lands on the margins of such rivers and creeks of the Eastern Shore of this State as the Board of Public Works may think proper and recommend, and to complete and carry into effect such plans for opening and improving the navigation of the Pokomoke, Manokin, Wicomico, Great Choptank, Chester, Elk, and North East Rivers, as the Board of Public Works may devise, recommend, and contract for, on behalf of the State of Maryland: *Provided*, That, before any part of the aforesaid subscriptions, except so much as is payable in the stock and debt of the Potomac Company, shall be made, or any part of the sum herein appropriated to execute the improvements contemplated by this act to be made, on the low lands situated on the margins of the aforesaid rivers and creeks, or to execute the

improvements of the Pocomoke, Manokin, Wicomico, Great Choptank, Chester, Elk, and North East Rivers be expended, the Congress of the United States shall, by law, authorize a subscription for not less than ten thousand shares of the capital stock of the eastern section of the Chesapeake and Ohio Canal, and shall enact a law expressly securing to the State of Maryland, and to any company incorporated, or hereafter to be incorporated by the said State, the right to take and continue a canal from any point of the Chesapeake and Ohio Canal through the Territory of Columbia, or any part thereof, to the said State, in any direction it may deem proper, upon the same terms and conditions, and with all the rights, privileges, and powers, of every kind whatsoever granted to the Chesapeake and Ohio Canal Company by the act of incorporation, and deciding agreeably to the act of Congress passed at December session, eighteen hundred and twenty-four, that the canal, as located by the Board of Public Works under the authority of this act, may be cut without impeding or injuring the navigation of the Chesapeake and Ohio Canal. *And provided, also.* That the Board of Public Works shall previously ascertain and certify to the Executive the practicability of connecting, by the canal described in this act, the Chesapeake and Ohio Canal with the Patapsco River at the city of Baltimore; and if the said Board of Public Works shall adopt for the said canal a line wholly within the State of Maryland, then the act of Congress last mentioned in the foregoing proviso, shall not be necessary to authorize the subscriptions and expenditures aforesaid: *And provided, also,* That the Executive shall previously be satisfied that the residue of the sum of money estimated by the United States' Board of Engineers to be adequate to the completion of the eastern section of the Chesapeake and Ohio Canal, after deducting the amount of the subscriptions of the State of Maryland and of the United States, herein provided to be made, hath been actually subscribed by bona fide and competent subscribers."

An act to amend the "Act incorporating the Chesapeake and Ohio Canal Company."

SEC. 1. *Be it enacted by the General Assembly of Maryland,* That the act, entitled "An act incorporating the Chesapeake and Ohio Canal Company, passed by the General Assembly of Virginia, at the December session, eighteen hundred and twenty-three," which has already received the assent of the State of Maryland, and of the Congress of the United States, as well as of the Potomac Company, shall be, and the same is hereby, amended, in the manner hereinafter provided, on condition that this act receive, in like manner, the assent of the necessary parties thereto.

SEC. 2. *And be it further enacted,* That the Chesapeake and Ohio Canal Company shall have power to terminate the eastern section of the said canal, at or near the town of Cumberland, on the river

Potomac, and thence, to extend the western section thereof, in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, towards Pittsburg, on the river Ohio; and, in extending the same in any direction across the dividing ridge which separates the Eastern and Western waters, to substitute for a tunnel, and numerous locks, on such part of the route, inclined planes and railways, or any other artificial communication or roads; and, in the event that the western section of the Chesapeake and Ohio Canal shall leave the valley of the Potomac river at any point below the Coal Banks, at or near the mouth of Savage, on the North Branch thereof, the Company shall have the power, in like manner, to extend a branch from the main canal, to the said Coal Banks, at or above the mouth of Savage, and to cause such branch to be constructed, of such dimensions as their views of their own and the public interest may warrant; and, for the construction of the same, shall have and enjoy the same rights, privileges, and immunities, under the same restraints and conditions, in all respects, as they are entitled to in relation to the main Chesapeake and Ohio Canal.

SEC. 3. *And be it further enacted*, That nothing in this act contained shall be held to discharge the said Company from a compliance with each and every of the conditions of the original act, except so far as the same are expressly altered by the provisions of this act.

SEC. 4. *And be it further enacted*, That this act shall commence and be in force as soon as it shall have received the assent of the Legislature of Virginia, of the Congress of the United States, and of the Potomac Company.

We certify the foregoing is a true copy of the original act, passed the Legislature of Maryland, at their present session.

Witness our respective signatures, this sixth day of February, in the year of our Lord one thousand eight hundred and twenty-seven.

W. KILTY, *Clerk Senate.*

GIDEON PIERCE,

Clerk House of Delegates, Md.

No. 6.

ACT OF THE CONGRESS OF THE UNITED STATES.

An act confirming an act of the Legislature of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company," and an act of the State of Maryland, confirming the same.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the act of the Legislature of the State of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company," be, and the same is hereby,

ratified and confirmed, so far as may be necessary for the purpose of enabling any company that may hereafter be formed by the authority of said act of incorporation, to carry into effect the provisions thereof, in the District of Columbia, within the exclusive jurisdiction of the United States, and no further.

SEC. 2. *And be it further enacted.* That, should the State of Virginia or Maryland desire, at any time, to avail itself of the right secured to it by the twenty-first section of the act aforesaid, to take and continue a canal from any point of the Chesapeake and Ohio Canal, to any other point within the territory of the District of Columbia, or through the same, on application to the President of the United States, by the Executive of the State, the President is authorized and empowered to depute three skilful Commissioners of the United States' Corps of Engineers, to survey and examine so much of the route of such canal as may affect, in any manner, the navigation of the Chesapeake and Ohio Canal. The said Commissioners, or a majority of them, shall ascertain, as far as practicable, whether the canal proposed to be constructed by the State aforesaid, will injure or impede the navigation of the Chesapeake and Ohio Canal, and report to the President of the United States the facts and reasons on which they may ground their judgment thereupon: which report shall be submitted to the Congress of the United States at their session next ensuing the date thereof, for their decision thereon; and if Congress shall be of opinion that the said canal may be cut in the manner proposed as aforesaid, without impeding or injuring the navigation of the Chesapeake and Ohio Canal, the same shall be conclusive thereon.

H. CLAY,

Speaker of the House of Representatives.

JOHN GAILLARD.

President of the Senate, pro tempore.

WASHINGTON, March 3, 1825.—Approved:

JAMES MONROE.

No. 7.

PROCEEDINGS OF THE GENERAL MEETING OF THE POTOMAC COMPANY.

GEORGETOWN, D. C. 16th May, 1825.

At a special meeting of the stockholders of the Potomac Company, held this day at Semmes' Tavern, previous notice thereof having been given conformably to law—

The following resolutions were unanimously adopted:

That this meeting, having duly considered the act of the General Assembly of the State of Virginia, passed at the December session thereof, in the year 1823, entitled "An act incorporating the Chesa-

peake and Ohio Canal Company," and the acts of the General Assembly of Maryland, and of the Congress of the United States, confirming the same, and being willing and desirous that the charter shall be granted and confirmed to the said Chesapeake and Ohio Canal Company, do hereby declare the full and free assent of the Potomac Company, to the said act incorporating the said Chesapeake and Ohio Canal Company, and to all the provisions thereof.

That the President of the Potomac Company be, and he is hereby, required to deliver to the Executives of the States of Virginia, Maryland, and Pennsylvania, respectively, and to the Secretary of the Treasury of the United States, copies of the foregoing declaration of assent and corporate act of the Potomac Company, as required by the 1st section of the act of the General Assembly of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company."

That the President and Directors of the Potomac Company be, and they are hereby, authorized and required, in the name and behalf of this Company, whenever agreeably to the terms and provisions of the aforesaid Act of Virginia, entitled "An act incorporating the Chesapeake and Ohio Canal Company," the subscribers therein mentioned and referred to, shall have become incorporated, to make a surrender of the Charter of the Potomac Company, to the said Chesapeake and Ohio Canal Company, and to convey in due form of law to the said Chesapeake and Ohio Canal Company, all the property, rights, and privileges, owned, possessed, and enjoyed, by the said Potomac Company, under their said charter, to be held, used, and occupied, by the said Chesapeake and Ohio Canal Company. in the same manner and to the same effect, as the said Potomac Company now hold, possess, and occupy the same, by law. And it is hereby resolved and declared, that, upon the completion of the said surrender and conveyance by the said President and Directors, to be evidenced by deed or deeds, in the name of this company, under the hands of the said President and Directors or a majority of them, and the corporate seal of this Company, the said charter shall be, and hereby is, effectually surrendered, and all the said property, rights, and privileges, shall be, and hereby are, effectually conveyed to the said Chesapeake and Ohio Canal Company, according to the tenor and effect, true intent and meaning, of the said act and acts so incorporating the Chesapeake and Ohio Canal Company, as aforesaid.

In testimony whereof, the corporate act as the Potomac Company, &c.

OFFICE OF THE POTOMAC COMPANY,

Georgetown, 16th May, 1825.

I hereby certify the foregoing to be a true and faithful extract from the records of the proceedings of the Potomac Company.

ROBT BERNARD,

Treas. and Clk. Poto. Com.

Extracts from the Charter of the Patomac Company.

Granted November 1784.

“Sec. 4. *And be it enacted*, That the said President and Directors, so elected, and their successors, or a majority of them assembled, shall have full power and authority to agree with any person or persons, on behalf of the said Company, to cut such canals, and erect such locks, and perform such other works as they may judge necessary, for opening, improving, and extending the navigation of the said river, above tide water, to the highest part of the North Branch, to which navigation can be extended, and carrying on the same from place to place, and from time to time, and upon such terms, and in such manner, as they shall think fit; and out of the money arising from the subscriptions and the tolls, and other aids hereinafter given, to pay for the same; and to repair and keep in order the said canals, locks, and other works, necessary thereto.

Sec. 11. And whereas it is necessary for the making of the said canal lock, and other works, that a provision should be made for condemning a quantity of land for the purpose: *Be it enacted*, That it shall and may be lawful for the said president and directors, or a majority of them, to agree with the owners of any land through which the said canal is intended to pass, for the purchase thereof; and, in case of disagreement, or in case the owner thereof shall be a *femme covert*, under age, *non compos*, or out of the State, on application to any two justices of the county in which such land shall lie, the said justices shall issue their warrant, under their hands, to the sheriff of their county, to summon a jury of twenty-four inhabitants of their county, of property and reputation, not related to the parties, nor in any manner interested, to meet on the land to be valued, at a day to be expressed in the warrant, not less than ten, nor more than twenty days thereafter; and the sheriff, upon receiving the said warrant, shall forthwith summon the said jury; and, when met, shall administer an oath, or affirmation, to every jurymen that shall appear, that he will faithfully, justly, and impartially, value the land, (not exceeding, in any case, the width of two hundred feet,) and all damages the owner thereof shall sustain, by the cutting the canal through such land, according to the best of his skill and judgment; and that, in such valuation, he will not spare any person for favor or affection, nor any person grieve for hatred, malice, or ill will; and the inquisition thereupon taken shall be signed by the sheriff, and some twelve or more of the jury, and returned by the sheriff to the clerk of his county, to be by him recorded: And upon every such valuation, the jury is hereby directed to describe and ascertain the bounds of the land by them valued, and their valuation shall be conclusive on all persons, and shall be paid by the said president and directors to the owner of the land, or his legal representative: and, on payment thereof, the said company shall be seized *in fee* of such land, as if conveyed by the owner to them and their successors by legal conveyance.

Sec. 12. *And be it enacted*, That the said president and directors, or a majority of them, are hereby authorized to agree with the proprietor, for the purchase of a quantity of land, at or near such of the place of receipt of tolls aforesaid, for the purpose of erecting necessary buildings; and in case of disagreement, or any of the disabilities aforesaid, or the proprietor being out of the State, then such land may be valued, condemned, and paid for, as aforesaid, for the purpose aforesaid; and the said company shall, upon the payment of the valuation of the said land, be seized thereof *in fee simple*, as aforesaid.

Sec. 13. And whereas some of the places through which it may be necessary to conduct the said canals may be convenient for erecting mills, forges, or other water-works, and the persons, possessors of such situation, may design to improve the same; and it is the intention of this act not to interfere with private property, but for the purpose of improving and perfecting the said navigation: *Be it enacted*, That the water, or any part thereof, conveyed through any canal or cut made by the said company, shall not be used for any purpose but navigation, unless the consent of the proprietors of the land, through which the same shall be led, be first had."

No. 8.

ACT OF THE STATE OF PENNSYLVANIA.

An act incorporating the Chesapeake and Ohio Canal Company.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same*, That the full and entire assent of this Commonwealth be, and the same is hereby, given to all and each of the provisions mentioned and contained in an act of the Legislature of the State of Virginia, passed the twenty-seventh day of January, one thousand eight hundred and twenty-four, entitled "An act incorporating the Chesapeake and Ohio Canal Company," so far as the same are or may be applicable to this Commonwealth; and the said act of the State of Virginia is hereby adopted, ratified, and confirmed, and enacted into a law of this Commonwealth, and all and each of the provisions, conditions, and restrictions thereof, as fully and effectually, as if the same were enacted, paragraph by paragraph, and section by section, so far as the same can apply to this Commonwealth; always, nevertheless, subject to the exceptions, provisions, and restrictions, hereinafter mentioned; and the said act shall hereafter be in full force and effect, wherever the same is applicable, as well within, as without this Commonwealth, as an act incorporating the Chesapeake and Ohio Canal Company, for all and every of the objects and purposes therein set forth and provided for, according to the true intent and meaning of the said act of the State of Virginia;

an exemplification whereof shall be annexed to this act, and be published in the same manner as the laws are usually published; and the Governor shall likewise cause an exemplified copy of the said act of Virginia to be deposited in the Secretary's office of this Commonwealth, and shall also transmit an attested copy of this act to the President of the United States, and one copy thereof to the Governor of Virginia, and one copy thereof to the Governor of Maryland.

SEC. 2. *And be it further enacted by the authority aforesaid, That* this act shall have no effect, unless, within three years from and after the passage hereof, the State of Maryland shall pass a law authorizing the State of Pennsylvania, or any company which may be for that purpose incorporated by the State of Pennsylvania, to take and continue a lateral canal or canals, or rail way, from any point or points within the territory of Pennsylvania, to, and connect with, the Chesapeake and Ohio Canal, within the territory of the said State of Maryland, and upon the same terms and conditions, and with all the rights, privileges, and powers, of every kind whatsoever, that the Chesapeake and Ohio Canal Company may have to make the said Chesapeake and Ohio Canal, and unless the said Chesapeake and Ohio Canal Company shall assent to and accept the said law of the State of Maryland, within one year after it shall have been enacted; *Provided, That,* should the said Chesapeake and Ohio Canal be located on the south side of the Potomac, at any point or points below the town of Hancock, then the assent of Virginia, and the said Chesapeake and Ohio Canal Company shall also be obtained in like manner, before this act goes into operation, except so far as it requires the assent of Maryland to the right to make a railway through the territory of that State.

SEC. 3. *And be it further enacted by the authority aforesaid, That,* as a condition on which this act shall pass, no greater tolls shall be charged or paid on goods, commodities, and produce, entering and transported on the said Chesapeake and Ohio Canal, from such lateral canals, than are charged and paid on other goods, commodities, and produce of the same kind, transported on the said Chesapeake and Ohio Canal: *And provided further, That* the aforesaid Chesapeake and Ohio Canal Company shall extend the Chesapeake and Ohio Canal to, and terminate the same at, the city of Pittsburg.

SEC. 4. *And be it further enacted by the authority aforesaid, That* the said Chesapeake and Ohio Canal Company shall have full power and authority to alter and change the route of the western section of the said canal, so that the same may commence at the town of Cumberland, situated near the junction of Wills' creek, with the north branch of the Potomac, and be continued from thence, by the valley of Wills' creek and Castleman's river, to the Youghiogany, and, from thence to the city of Pittsburg: *Provided, That* the United States' Board of Internal Improvement, or a majority thereof, should deem and report that route to be the best.

SEC. 5. *And be it further enacted by the authority aforesaid, That,* should the United States of America subscribe to the stock of the

said Chesapeake and Ohio Canal Company, the said company shall, within six months after receiving the sum subscribed, commence the western section of said canal, at such point or points as may be deemed most advantageous to the interests of the said company; and it shall be their duty to apportion at least one half of the subscription of the United States to the western section of the said canal. And whatever amount of stock may be subscribed by the citizens of Pennsylvania, shall be expended wholly on the western section, unless authority is given to the said company, by the Pennsylvania subscribers, to expend their subscriptions differently; and in case of failure of the said company to comply with the provisions herein set forth, this act shall cease to have any force or effect whatever.

SEC. 6. *And be it further enacted by the authority aforesaid, That,* if the nett annual dividend of said company shall, for any two years in succession, exceed the amount of fifteen per cent. such excess shall be equally applied, by the president and directors, to the accommodation of the inhabitants of the shores of the Youghiogany and Monongahela rivers, and the country drained by the tributary streams thereof, now navigable, or which may hereafter become so, in the same manner, in proportion to the distance, as is directed for the accommodation of the inhabitants of the shores of the Potomac and its tributary streams, by the eleventh section of an act of the State of Virginia, entitled "An act incorporating the Ohio and Chesapeake Canal Company," passed the twenty-seventh day of January, one thousand eight hundred and twenty-four.

SEC. 7. *And be it further enacted by the authority aforesaid, That* it shall and may be lawful for the said Chesapeake and Ohio Canal Company, at any place within this Commonwealth, on the route of the said canal, to sell or lease the use of the water contained therein, or in any embankment, dyke, pond, or other improvement connected therewith, to any individual or individuals, or private company or companies, for that purpose incorporated by the State of Pennsylvania, for mills, or any other water works, or for irrigating any lands, or for supplying bleach grounds, tan pits, or brick yards, and the profits or rents resulting therefrom, to take and receive to, and for the use and benefit of, the said corporation, in addition to the tolls and profits allowed to be taken by the act of Virginia: *Provided, That* the navigation of the said canal be not thereby impeded or obstructed: *And provided further, That* the said Chesapeake and Ohio Canal Company shall not, at any time, be, directly or indirectly, engaged or concerned in any banking, merchandising, milling, or the erecting of mills, manufacturing, or mining, or in any other business whatsoever, except such as may be necessary and proper for the construction of such canal and appurtenances, and the performance of the several functions of a canal company.

SEC. 8. *And be it further enacted by the authority aforesaid, That,* as a further condition on which the assent of this State is given to the Virginia act, aforesaid, that, so far as regards the territory of Pennsylvania, whenever the said canal shall cross any public or private

laid out road or highway, or shall divide the ground of any person or persons, so as to require a ford or bridge to cross the same, the jury, who shall inquire of the damages to be sustained, in manner directed by the fifteenth section of the Virginia act, shall find and ascertain whether a passage across the same shall be admitted or maintained by a ford or bridge; and, on such finding, the said Ohio and Chesapeake Canal Company shall cause a ford to be rendered practicable, or a bridge fit for the passage of carts and wagons to be built, and forever hereafter maintained and kept in repair, at all and every places so ascertained by the said jury, at the cost and charges of the said company; but nothing herein contained shall prevent any person from erecting and keeping in repair, any foot or other bridge across the said canal, at his own expense, when the same shall pass through his ground: *Provided*, The same shall be of such height above the water, as shall be usual in the bridges erected by the company: *And provided, also*, That such foot or other bridges, so to be erected by the owners of such lands, shall not interfere with any of the locks, buildings, or other works of the company, or with the navigation of the said canal.

SEC. 9. *And be it further enacted by the authority aforesaid*, That the assent of the Legislature of this Commonwealth to the said act of the Legislature of Virginia, is given and granted upon the further express conditions, that any mesne process which may be issued against the said company, may be served on any toll gatherer, director, or other officer of the company; and such service shall be held good, valid, and effectual, as a service of such process upon the said Ohio and Chesapeake Canal Company; and that said company shall annually report to the Legislature of Pennsylvania the progress they may make in constructing the said canal; and also an annual abstract of their accounts, certified by the oath of the President of the said company, shewing the amount of capital stock actually paid in, and the sums deposited with the Treasurer for contingent and current expenses, and the profits which may have accrued, and the dividends made or declared during the preceding year.

No. 9.

Extract from the Report of the United States' Engineers of the 23d of October, 1826, communicated to the House of Representatives with the President's Message of the 7th December, 1826.

“PLAN AND ESTIMATE OF THE CANAL.

The transverse section of the canal is exhibited on the sheet No. 3. The breadth at the bottom is 33 feet; at the surface 48 feet; the depth of water, 5 feet; the tow-path, 9 feet wide; the guard-banks.

5 feet at the top; the surf berms, kept on the level of water, 2 feet wide, each; the tow-path, and top of the guard-bank, 2 feet above the surface of the canal.

This transverse section is to be modified where local circumstances require it; and, more especially, in the cases of deep cutting, steep side cutting, embanking, and also, where the canal is supported by walls. In the framing of the plan, a due attention has been paid to these modifications, with a view to conciliate the convenience of the work with the strictest economy. The depth of five feet has been preserved throughout the line, but the breadth has been often much lessened. As to the surf berms, they are intended to protect the slopes from being washed off; as also to lessen the resistance opposed to the boat, by affording to the eddy water a free passage.

We must submit, however, the reasons which led us to propose the above dimensions.

The experiments made in 1775, by the French Academicians (D'Alembert, Condorcet, and Bossuet,) have shown: 1. That the resistance of water to the perpendicular motion of a given plane, may be regarded as proportional to the square of the velocity: 2. That, the velocity being the same, the resistance of water may be considered as proportional to the area of the plane; 3. That these results obtained only in the case of an indefinite expanse of water: 4. That, in narrow canals, the resistance increases in a more rapid ratio than the square of the velocity.

To attenuate, as much practicable, this inconvenience, researches have been made to ascertain what should be the ratio between the transverse section of the canal and the transverse section of the boat, in order that the boat might move through such a canal, as through an indefinite expanse of water. Experiments made on the subject, by the celebrated Chevalier Dubuat, have shown that, to attain this result, the cross section of the canal ought to be, with moderate velocities, $6\frac{46}{100}$ times the cross section of the boat, and the water line $4\frac{1}{2}$ times the breadth of the boat.

Adopting, to preserve uniformity, $13\frac{1}{2}$ feet for the breadth of the boats used on the Chesapeake and Ohio Canal, [which is the breadth of the Erie Canal and of the Ohio Canal boats;] if we suppose the draft to be three feet, the prow to be rectangular, and the sides and bottom of the boat to conform to it, the cross section of the boat will be 40.5 square feet. Taking, now, this area $6\frac{46}{100}$ times, we find $261\frac{3}{4}$ square feet for the cross section of the canal, through which the boat would not meet with a greater resistance than through an indefinite expanse of water. The water line should be $60\frac{3}{4}$ feet, that is, four times and a half the breadth of the boat.

Were not expense to be taken into consideration, these dimensions might be recommended; but fitness of the work, and strict economy, must be reconciled as much as practicable; and it is in such a view that smaller dimensions are to be fixed upon.

It is to be remarked, that the distance from Georgetown to Pitts-

burg, in following the line of canal, is $341\frac{1}{2}$ miles, which, at the rate of $2\frac{1}{2}$ miles per hour, will be travelled in about - 136 hours. The ascent and descent, amounting together to 3,158 feet, will require, at the rate of 1 minute per foot, about 52

Distance, in time, from Georgetown to Pittsburg, 188

Though a number of canals, selected among those executed to this day, might afford, together, the distance and lockage found for the Chesapeake and Ohio Canal, yet there is not, within our knowledge, any line of the same extent, requiring even 1,800 feet of ascent and descent taken together: the Erie Canal requires 688 feet for 362 miles; the line from Liverpool to London, 1,451 $\frac{1}{4}$ feet, for 264 miles; the canal from the Rhone to the Rhine, connecting Lyons with Strasbourg, has about 1,458 feet of lockage for a length of 200 miles. The proposed canal has, therefore, as to time, a decided inferiority, when compared to a canal of the same length, but having a less amount of lockage; and it becomes, in the present case, indispensable to remedy this inconvenience. The means we propose consist in the increase of the dimensions of the cross section of the canal, with a view to compensate, by a greater weight, [transported without additional power,] for the virtual increase of distance caused by so great an amount of lockage.

We have shown that this section ought to be 261 square feet, with a water line of 60 feet, to procure a boat 13 feet 6 inches in breadth the advantage of moving on the canal, as on an indefinite extent of water. After many trials and minute calculations we have concluded to adopt, for the contemplated canal, the $\frac{4}{5}$ ths of the foregoing results, viz: for the cross section, 208 square feet; and for the water line, 48 feet; and from these data we have framed, with a depth of 5 feet, the general transverse profile of the canal, as exhibited on the sheet No. 3.

Let us now compare this profile to one having 40 feet at the surface, 28 feet at bottom, and 4 feet in depth: the boat used being the same for both, and having 13 $\frac{1}{2}$ feet in breadth, and 3 feet in draught.

We find, by calculations, that, the velocity remaining the same, the resistance to the boat moving in the 48 feet canal, is, to the resistance to the same boat moving in the 40 feet canal, as 1.21 to 1.58, or as 100 to 130. Therefore, at the same rate of velocity, 100 horses will, on the 43 feet canal, perform the same work as 130 horses on the 40 feet canal; and, with the same towing power, the weight transported on the 48 feet canal, will be to the weight transported on the 40 feet canal, as 130 to 100.

But the depth of the 48 feet canal being one foot greater than the depth of the other, let us examine what will be the comparative resistance of the boat being immersed 4 feet into the 48 feet canal, and but three feet in the other. We find, in this case, the ratio to be 1.47 to 1.58, or 100 to 107; and we infer from it that, with a gain of about seven per cent. of towing power, the weight transported on the 48 feet canal will be one-third greater than the weight transported, during the same time, on the 40 feet canal.

The foregoing considerations show, that, in determining the transverse section of a canal of great length, and with a dividing summit level, the amount of lockage must have a due influence upon the breadth and depth of the water section. And, indeed, taking into view the great distance and considerable lockage belonging to the present case, a cross section larger than that recommended, might have been suggested, had not a regard to economy, and to a competent supply of water during the dry season, forbidden it.

However, the transverse section, as just proposed, may be deemed sufficient to fulfil, in a satisfactory manner, the main requisite for which it has been intended. And, in order to remove all doubt, let us compare, as to amount of transportation, the contemplated Chesapeake and Ohio Canal with another of the same length, but whose lockage would be 600 feet only, with a transverse section of 40 feet at the surface, and 4 feet in depth.

The rate of travelling being supposed, for both, $2\frac{1}{2}$ miles per hour, and one minute allowed for each foot of lockage, sixty feet will be, as to time, equivalent to $2\frac{1}{2}$ miles, and these canals will then compare as follows :

The Chesapeake and Ohio Canal having 3,158 feet of lockage in a distance of $341\frac{1}{2}$ miles, is equivalent, as to time, to a single level canal of 473 miles, which would require 189 hours to be travelled from one end to the other.

The 40 feet canal, having 600 feet of lockage in a distance of $341\frac{1}{2}$ miles, is equivalent, as to time, to a single level canal of 367 miles, and which would be travelled in 146 hours from one end to the other. But it has been shown that, on the first canal, the amount of transportation being expressed by 130, it will be 100 on the 40 feet canal; the velocity and towing power remaining the same in both cases. Comparing, now, this ratio of 130 to 100, with that of the times employed to travel respectively each canal, viz : 189 hours to 146, it is found that these ratios are equal. Therefore, on either of these canals, and notwithstanding a difference of 2,558 feet lockage, an equal weight will be transported during the same time, and with an equal towing power ; a result entirely due to a larger transverse section having been assigned to the canal whose lockage is greater."

Letter from Gen. Bernard to Hon. C. F. Mercer.

WASHINGTON CITY, February 17, 1827.

SIR : I have the honor to forward to you the result of the calculation you asked for in relation to a canal 60 feet wide at the water-line, 45 at the bottom. and 5 feet deep.

The cross section of the boat remaining as assumed in the report on the Chesapeake and Ohio Canal, such a boat would, for the reasons set forth in this report, move, at moderate velocities, on the 60 feet canal, as on an indefinite extent of water.

The resistance proved, in this case, by the boat being expressed by 1, the number 1.21 will represent the relative resistance in a 48 feet canal, and 1.58 that in a 40 feet canal. Thus, with a towing power of 100 horses, the same work will be performed on the 60 feet canal as with 121 horses on the 48 feet canal, and 158 on the 40 feet canal: these two latter canals being here supposed to retain the respective cross sections assigned to them in the aforesaid report.

Now, assigning to these two canals the same comparative length and amount of lockage as alluded to in the report, they become on the same footing as to towing power. But the 60 feet canal has the same length and amount of lockage as the 48 feet canal; therefore, it will have an advantage of 21, or 18 per cent. over the latter as to towing power, and the same advantage over the 40 feet canal. In other words, 18 per cent. more weight would be transported, during the same time, and with the same towing power, on the 60 feet canal, than on the two others.

I have the honor to be, sir, very respectfully, your obedient servant,
BERNARD,

Brig. Gen.

To the Hon. C. F. MERCER, M. C.
Washington City.

No. 10.

Extract from Smith's Inquiry into the nature and causes of the Wealth of Nations, vol. 3, chap. 1, p. 96.

“In several parts of Europe, the toll or lock duty upon a canal is the property of private persons, whose private interest obliges them to keep up the canal. If it is not kept in tolerable order, the navigation necessarily ceases altogether, and along with it the whole profit which they can make by the tolls. If those tolls were put under the management of commissioners who had themselves no interest in them, they might be less attentive to the maintenance of the works which produced them.

The canal of Languedoc cost the King of France and the province, upwards of thirteen millions of livres, which amounted to upwards of nine hundred thousand pounds sterling. When that great work was finished, the most likely method, it was found, of keeping it in constant repair was, to make a present of the tolls to Riguett, the Engineer, who planned and conducted the work.”

P. 147. “When a navigable cut or canal has been once made, the management of it becomes quite simple and easy, and it is reducible to strict rule and method. Even the making of it is so, as it may be contracted for with undertakers, at so much a mile, and so much a lock.

Such undertakings, therefore, may be, and accordingly, frequently are, very successfully managed by Joint Stock Companies.” “That

navigable cuts and canals, are of great and general utility ; while, at the same time, they frequently require a greater expense than suits the fortunes of private people, is sufficiently obvious."

No. 11.

The Caledonian Canal, in Scotland, and a short cut of a few miles on the Thames, are the only works of this description in Great Britain, which have been constructed by the immediate agency, and out of the resources, of the National Government, of all the numerous canals of that island, amounting, in total length, to more than three thousand miles.

No. 12.

Extract from the Report of a Committee of the House of Delegates of Virginia, of the 28th of December, 1815, upon which the Virginia System of Internal Improvement and Board of Public Works were founded.

"It may be sound policy for the Commonwealth, in order to accomplish some great commercial or political purpose, to throw open to general use, without the charge of tolls, a particular canal or road ; but, it can never be its interest, for many reasons, to become the sole proprietor of all the public works within its territory. Experience testifies that they will be more economically made, and better repaired, if their management be left to the individuals who subscribe to their stock with a view to private gain, than if confided to public officers or agents. The Commonwealth should subscribe so much to their stock, and on such terms as will suffice to elicit individual wealth for public improvement ; and the control which she retains over the conduct of the individual subscribers, should extend no farther than to prevent or correct such abuses upon the community at large, as might be apprehended from the too eager incentive of gain.

By yielding to the individual subscribers the profit of the State on its shares of the stock of any company, where required to secure such individuals against temporary loss, a much smaller subscription of public money will suffice to draw forth private enterprise.

The Commonwealth can never be a loser, if a public work, judiciously begun, be finally perfected ; and the public security against such loss, will be found in the discretion which the Legislature retains over the choice of the objects for which its patronage is sought.

As the market rate of interest decreases in every commercial country, with the growth of its capital, the maximum profit of the stock of each company may be reduced, after the lapse of a limited period of time.

The least profit allowed by law, should be great enough to create the hope of private advantage in those whose enterprise can have no other object; and that *minimum*, which the community have so much interest in reducing, may be safely fixed at a lower amount, in proportion as the magnitude and conditions of the public subscription afford, to private adventurers, an indemnity against any ultimate loss."

The resolutions at the end of this report apply the preceding principles.

"8. *Resolved*, That the President and Board of Public Works, shall be authorized to subscribe, in behalf of the Commonwealth, to such public works as the General Assembly may, from time to time, agree to patronize, such portions of the revenue of the fund for Internal Improvement, as may be directed by law; but that no part of the fund shall be subscribed towards the stock of any Canal or Turnpike Company, until three-fifths, at least, of the whole stock, necessary to complete such Canal or Turnpike, shall have been otherwise subscribed, nor until, of the stock so subscribed, one-fifth part shall have been paid in by the respective subscribers, or the payment thereof effectually secured.

9. That the dividends upon the stock which may be subscribed by the President and Board of Public Works, shall go exclusively to other subscribers than the said President and Board, until such portion of the stock of those subscribers shall have nett to them six per centum per annum, from the specified time of such payment. That any increase of profit, after that nett income has been assured to those subscribers, shall belong exclusively to the Fund for Internal Improvement, until the nett annual income of the whole stock actually expended by any company shall reach six per centum per annum; after which, the President and Board of Public Works and the other subscribers to the Stock of the Company, shall divide the nett profits on such stock, in proportion to their respective interests.

10. That, whenever the nett income of any Company shall be found for two succeeding years, or upon an average of five succeeding years, to surpass fifteen per cent. per annum, the General Assembly may reduce the tolls from which such income is derived, so as to limit the nett revenue of the Company to that amount: *Provided*, That, should the tolls for any two succeeding years fail to yield a nett income to the Company of ten per cent. per annum, the President and Board of Public Works, on satisfactory evidence being adduced thereof, may authorize the tolls to be augmented so as to assure to the Company such nett income: *And provided, also*, That, after the lapse of sixty years, the maximum profit of the Company may be reduced to twelve per cent; and after the lapse of one hundred years, to ten per cent. per annum.

11. That the President and Board of Public Works, shall have power to vest in any productive fund, the unappropriated dividends accruing upon any of the stock committed to their charge, until the

same shall be specially applied, by law, to some object of internal improvement; that they may, from time to time, subject to the control of the General Assembly, sell the whole or any part of the shares held by the Commonwealth in the stock of any Canal or Turnpike Company, for the purpose of reinvesting the proceeds of sale in the stock of some other similar public work.

12. That the President and Board of Public Works shall have power to appoint, in behalf of the Commonwealth, so many directors of every public work, as shall bear to the whole number of directors, of such work, the proportion of the Commonwealth's shares of stock in such work, to the whole number of shares subscribed thereto.

13. That it shall be the duty of the President and Board of Public Works to keep a fair and accurate record of all their proceedings, to be at all times open to the inspection of the members of the General Assembly, and of the President, Directors, and other officers, of any company interested therein; that they shall report to the General Assembly at, or near the commencement of every annual session, the exact state of the funds for Internal Improvement, the progress and condition, noting, especially, the nett income of all the public works within the Commonwealth, the surveys, plans, and estimated expense, of such new works, as they may recommend to the patronage of the General Assembly, together with all other important information, which it may be in their power to collect, relative to the objects committed to their trust.

14. And lastly, *Resolved*, That the appropriations contained in these resolutions shall continue in force, until the first day of January, 1900, except, at such times as the United States of America may be involved in war, when the Legislature may withdraw, during the period of actual hostilities, the whole or any part of the said fund, for the purpose of defence; provided such withdrawal can be made without a breach of public faith."

The preceding resolutions, which had been submitted to the General Assembly of Virginia, with many others relating to the same topic, as early as the 15th of December, 1812, were, on the 5th of February, 1816, made the basis of a law of that Commonwealth, still in force.

A bill has recently passed the Legislature of the State of New York to aid the Delaware and Hudson Canal Company by a loan of credit to the amount of \$500,000.

No. 13.

Extract from a Report of the United States' Board of Internal Improvement, of the 23d of October, 1826, transmitted to the House of Representatives, December 7, 1826.

"We should here remark that the Union owns, in the States of Ohio, Indiana, Illinois, and the Michigan Territory, 59,993,000 acres of land, to which the Indian title is extinguished, besides 13,946,000 acres

not yet ceded : valuing the first at two dollars per acre, we have \$119,996,000 ; and supposing only ten per cent. for the augmentation of value they will receive, we find the Union, as landholder, will gain about \$12,000,000 by the opening of the canal : to which should be added the land owned by the Government in the District of Columbia."

A prior report of the Committee of the House of Representatives for the District of Columbia, of the 3d of May, 1822, refers to this subject in the following terms :

" With an almost boundless authority over the District of Columbia, the Government of the United States acquired new, urgent, and daily increasing interests in the navigation of the Potomac."

" In the rapid improvement, and consequent security of the seat of the Federal Government from foreign danger, are involved, not only the preservation of the property, and lives of its inhabitants, the accommodation and comfort of its numerous public functionaries, but, in no small degree, the national character and honor. The most deplorable calamity of the late war would, doubtless, have been averted, had the Capital of the United States been encompassed by the dense population of a large city, by such a population as would unquestionably succeed the contemplated improvement of the navigation of the Potomac. And, if sordid views may be allowed to mingle with considerations of such inestimable consequence, it may be added that, with the growth of the numbers and opulence of a great commercial emporium, would of necessity arise a corresponding appreciation of the value of all the disposal public lands in the city of Washington, consisting of more than 5,000 vacant lots, and now computed at near 2,000,000 dollars, it is not unreasonable to suppose, that their value would be quadrupled, by a prospect of their early occupation and improvement."

No. 14.

See the letter of General Bernard, in Note 9, and the preceding extracts from the report of the Board of United States' Engineers.

No. 15.

The United States' Board of Internal Improvement have estimated the cost of the Chesapeake and Ohio Canal at \$22,375,427 69 cents, and in that estimate have distributed the entire canal into three sections, denominated respectively eastern, middle, and western. The eastern begins at Georgetown, and ends at Cumberland ; the middle begins at Cumberland, and ends at the mouth of Casselman's river,

on the Youghiogany; the western extends from thence to Pittsburg. The following table expresses the respective distances, elevation or descent, lockage, and computed cost, of these sections :

	Distance.		Ascent & descent.	Number of locks.	Amount of the estimate.
	Miles.	Yds.	Feet.		
Eastern Section,	185	1,078	578	74	\$8,177,081 05
Middle Section,	70	1,010	1,961	246	10,028,122 86
Western Section,	85	348	619	78	4,170,223 78
	341	676	3,158	398	22,375,427 69

This estimate the recent Convention of Delegates from several States, assembled in Washington, embracing many men of much practical knowledge, and several experienced Engineers, unanimously concurred in reducing below one half of its entire amount. The Convention were guided in this reduction chiefly by the actual contract prices of work done upon other canals within the United States, either already constructed, or in progress, and especially on the contracts for those of the State of Ohio and Pennsylvania, which are made at public expense. The similitude of that part of the Chesapeake and Ohio Canal, which will ascend the Monongahela from Pittsburg to the canal already extended from that city up the Alleghany river, and of the contemplated canal along the Potomac, to that in part constructed along the Susquehannah, furnishes a solid ground on which to rest this standard of prices. Tried by this standard, the estimate of the United States' Board exceeds the probable cost of the Chesapeake and Ohio canal twelve millions of dollars. It is believed, therefore, that the eastern section of the Chesapeake and Ohio canal may be extended to the coal banks of the Alleghany, on the enlarged plan recommended by the bill accompanying this report, for less than five millions of dollars; and that, for six millions more, the entire canal to Pittsburg, including its tunnel, may be completed. The Committee having founded this belief on the reports of certain committees of the late Washington Convention, for the satisfaction of the House of Representatives, they include those reports in this appendix. Their results were also confirmed by the information of their own body, a member of which was for some time a contractor upon the Erie Canal of New York.

Report of the Central Committee of the Chesapeake and Ohio Canal Convention. December 6th, 1826.

The Committee, acting under a resolution of the Convention of Delegates from certain counties and corporations of the States of Virginia, Maryland, Pennsylvania, Ohio, and the District of Columbia, which assembled, pursuant to a public invitation and notice, in the Capitol of the United States, on the 6th day of November, 1823, have presumed to request a re-assemblage of that Convention, under the authority vested in them, of "consulting upon, and adopting, in behalf of the Chesapeake and Ohio Canal, such measures as may seem best calculated to assure its certain and speedy completion;" and now submit to the Convention the following report:

That, as soon as practicable after the adjournment of the Convention, on the 8th of November, 1823, they entered on the performance of the several duties specifically devolved on them by the resolutions adopted by the Convention on that day.

Memorials were promptly prepared by the Special Committees of Maryland and Virginia; and, being submitted to this Committee, and approved by them, were presented, on behalf of the Convention, to the Legislatures of those States respectively.

To avoid delay, the Committee appointed to prepare the memorial designed for the Legislature of Pennsylvania, was requested to forward it directly to Harrisburg, from the residence of its Chairman.

Before a memorial was addressed to the Legislature of Ohio, to suggest the expediency of causing the line of a canal to be surveyed, extending from the Ohio River, by means of the waters of Big Beaver and Cuyahoga river, to the southern shore of Lake Erie, the Committee appointed for that purpose were apprized that the recommendation from the President of the United States, in his address to both Houses of Congress, would probably lead to its more prompt execution by the United States' Engineers. In accordance with the decision of the Convention, the act of the Legislature of Virginia, of the 22d of February, 1823, incorporating the "Potomac Canal Company," was assumed as the basis of the charter of the Chesapeake and Ohio Canal Company, and the modifications of that act, required by the resolutions of the Convention, together with such others as were deemed expedient by the Committee, were superadded to its provisions, in a bill, copies of which were contemporaneously forwarded to Richmond and Annapolis, before the expiration of the year 1823. A correspondence was, at the same time, instituted between the Committee and the active friends of the Chesapeake and Ohio Canal, in the several Legislatures of Virginia, Maryland, and Pennsylvania.

In the last, it was deemed expedient to await the agreement of Maryland and Virginia on the terms of any charter which should have the effect of superseding that of 1784, granted by those States to the existing "Potomac Company," and the formal acquiescence of that Company in such an agreement.

Any application to Congress, in behalf of the District of Columbia,

through which the new Canal would be required to pass, was also delayed for the same reason.

The assent of any other party to the terms of the proposed charter, before the concurrence in its favor of the two States most deeply interested in it, might, it was apprehended, retard its progress towards maturity, by opposing a new obstacle to such modifications of its numerous details, as either of these States might be inclined to insist upon as a condition of its ratification.

On the 27th of January, 1824, the bill which had followed the memorial of the Convention to Richmond, received the sanction of the General Assembly of Virginia, though not before it had been amended, on the suggestion of the friends of the common enterprise in the Legislature of Maryland, through the Central Committee, in such manner as was deemed by them best calculated to remove every legal impediment to the future union of the waters of the Patapsco with the Chesapeake and Ohio Canal; nor, until it had been accompanied by a formal declaration, on the part of the Legislature of Virginia, that the act, which she had approved, and to which the assent of the United States was invited, should not be construed into an admission, on her part, of the much contested power of the Federal Government to institute a System of Internal Improvement.

The first of these amendments, from the manner in which it modified the section in which it was inserted, afforded the strongest evidence of the disposition of the Central Committee, and of the advocates of the Chesapeake and Ohio Canal in the Legislature of Virginia, to accommodate their friends in Annapolis.

As soon as it was known, however, that the General Assembly of Maryland had risen, without concurring in the new charter, an abortive effort was made to obtain for it the sanction of Pennsylvania, in the hope, entertained by the Committee, that the accession of that State to the terms of the charter, would occasion a more propitious result at Annapolis, the ensuing Winter. It was also designed to ground upon the co-operation of Pennsylvania with Virginia, an application to Congress, during its still depending Session, for a confirmation of the joint act of those States, with a view to the same end.

The failure of the first effort involved that of both.

It was not until the 31st of January, 1825, or near the close of their ensuing session, that the General Assembly of Maryland confirmed the act of Virginia incorporating "the Chesapeake and Ohio Canal Company." The confirmatory act sat out with a declaration that, by accepting the act of Virginia, the Legislature of Maryland did not intend to deny to the Congress of the United States the constitutional power to legislate on the subject of roads and canals, and closed with a provision, operating as a conditional defeasance of the act itself, in the event than an additional facility was not afforded to the State of Maryland for connecting her commercial metropolis, by a lateral canal, with the main stem. As this new facility simply depended on the exercise of the acknowledged power of the Federal Government over the District of Columbia, it required an application

to Congress alone. On being made, all that it asked was promptly conceded, by an act of the 3d of March, 1825. The same act also expressed, though in ambiguous terms, the consent of Congress to the Virginia charter; but yet, when attentively examined, admitted of but one legal construction, and that adapting the act itself, to its obvious end. It remained, now, for the accession of the existing Potomac Company to the terms of the new charter, to complete the power of extending the Chesapeake and Ohio Canal as far west, in its prescribed course, as the common boundary of Pennsylvania and Maryland.

On the 16th of May, 1825, the Stockholders of the Potomac Company, at a special meeting, unanimously accepted the terms which the *new* offered for the surrender of their *old* charter; and, in the following Summer, the President of the United States and the Executives of the States of Maryland and Virginia, on the application of the Central Committee, appointed Commissioners to open books of subscription to the stock of the new Company.

The assent of Pennsylvania still continued to be withheld, notwithstanding the zealous exertions of the friends of the proposed canal in the popular branch of her General Assembly; where a bill, designed to perfect the new charter, after a protracted discussion, and being encumbered with amendments incompatible with its object, was indefinitely postponed.

A charter, however, did, and does at this time exist, in a form competent to the execution of the greater part, if not the whole of the proposed Canal, and it awaits only the subscription of the necessary funds for the commencement of a work to which, in its future progress, the consent of Pennsylvania might be confidently expected.

The Commissioners, however, authorized to open books for the subscription of stock, acting in concert with the Committee, deemed it expedient to defer the execution of this trust, and have continued to do so, for reasons, in explanation of which, it is necessary to recur to the period when this narrative began.

At the commencement of the Session of Congress, which next followed the meeting of the Convention, the President of the United States, in adverting to its proceedings, suggested the expediency "of providing, by an adequate appropriation, for the employment of a suitable number of the officers of the Corps of Engineers to examine the *unexplored ground*, during the next season, and to report their opinion thereon. Pursuing the object of one of the resolutions of the Convention, "it will be like the proper," the President added, "to extend their examination, to the several routes, through which the waters of the Ohio may be connected, by canals, with those of Lake Erie."

The resolutions of the Convention expressly contemplated a connexion of the tide of the Potomac with the regular steam boat navigation of the Ohio river, by a single canal, passing through the territory of the United States within the District of Columbia, along the common river border of Maryland and Virginia, as high up as the mouth

of Savage ; thence, through the territory of the former, and of the adjacent State of Pennsylvania, as far west, if necessary, as the confluence of the Alleghany and Monongahela rivers, at Pittsburg. They sought, also, to provide, by a distinct canal, for a termination yet more remote, and, emboldened by recent intelligence from Ohio, looked along the valleys of the Big Beaver and Cuyahoga rivers, to the southern shores of Lake Erie, and a connexion, by an unbroken and uniform inland navigation, of the Seat of the Federal Government with the Atlantic, the Gulf of Mexico, and the great Northern Lakes.

By acquiring for the State of Maryland a right which she did not before possess, to make a lateral canal between the waters of the Potomac and the Patapsco, or any other river of her territory, they further designed to promote an extension of this navigation to the commercial metropolis of the Chesapeake, and to such other points on that great estuary as her interests might hereafter recommend.

So much of this extended line of artificial navigation, as, pursuing the valley of the Potomac from its tide, terminates at Western Port, the base of the Alleghany mountain, could not be regarded as *unexplored ground*. The Ohio Company of Maryland and Virginia, which established the town of Cumberland, in the year 1749, at that early period, used the river Potomac for the purposes of transportation ; and proposals to lock its principal falls were published in Europe before the war of the Revolution, at a period when the British Ministry had under favorable consideration a proposal to erect a new Colonial Government west of Virginia, west of the Alleghany, on the river Ohio.

By the "Potomac Company," created in 1784, at the instance of General George Washington, the total descent of this river from the same point, as well as its length, had been ascertained by examination and survey. At a very recent period, following immediately, however, the first suggestion of the possibility of uniting the waters of the Potomac and Ohio, by a navigable canal across the dividing ridge, as a substitute for the very laborious portage between those rivers, the principal Engineer of Virginia, first, by authority of the Board of Public Works of that Commonwealth, and, afterwards, under the joint authority of the States of Maryland and Virginia, in conjunction with an experienced civil Engineer of the former, carried the long antecedent survey and examination of the waters of both rivers, to Deep Creek, in the Glades of the Alleghany, and, in both instances, ascertained their levels and distances so far, towards the Ohio, as to induce the belief that their junction, by a canal, was practicable. As far as the mouth of Savage, it was undoubted ; and as far up as Cumberland, an estimate was supplied under the authority of the Commissioners deputed by the States of Maryland and Virginia to superintend the second survey. The inexhaustible banks of coal, of superior quality, bordering immediately on the Potomac, and rising far above its surface, constituted the chief motive for terminating, at the mouth of Savage, the eastern section of the Chesapeake

and Ohio canal; the value of this mineral being believed to be competent, alone, to defray the cost of constructing so much of the proposed canal, the practicability of which had been already demonstrated. An estimate for so much of the work had been submitted to the Convention, along with a detailed financial plan to provide its amount, which had also received their approbation.

From the mouth of Savage, in the line prescribed by the Convention and recommended by the antecedent reports of the Virginia and Maryland Engineers, a further survey and corresponding estimates were necessary throughout the western section; and the termination of the Chesapeake and Ohio Canal, on the Western waters, remained to be fixed, in reference to its ultimate extension, by Pittsburg, to the shore of Lake Erie. This constituted the *unexplored ground*.

As the profit of the eastern section of the canal would be immeasurably promoted by placing beyond the reach of a rational doubt the practicability of extending it, with a sufficient supply of water, across the mountains, which now oppose so formidable an obstacle to the direct trade of the valley of the Ohio and Mississippi with the seaports of the Chesapeake and the Atlantic, it was deemed expedient to delay an appeal to the public enterprise, for subscriptions of stock to defray the cost of this extensive work, until this propitious confidence should be confirmed.

An extension of the navigation of those great Western rivers, by one canal, to the cities of the District of Columbia; by another, from the head of their navigation to the Northern lakes; by a third, from the markets of the Potomac to that of the flourishing city of Baltimore; by a fourth, then in rapid execution, to the long established market of Philadelphia; and, by a fifth, already provided for, to the present emporium of the foreign trade of the United States, in New York; could not fail to attract the wealth of Europe, as well as America, and to multiply the chances of obtaining that portion of the capital stock, necessary for the completion of the Chesapeake and Ohio Canal, for which the Convention relied on individual subscriptions.

The President's recommendation to Congress was succeeded, in the same session, by a public act making the specific appropriation which he had suggested, for obtaining plans and estimates of such roads and canals as he might deem it expedient to cause to be surveyed, with a view to the transportation of the mail, the commercial intercourse, and military defence of the United States.

In the execution of this act, a supervising and administrative "Board of Internal Improvement" was created by order of the Executive, consisting of two military Engineers, and a civil Engineer. At their head was placed a distinguished naturalized citizen of the United States, an officer of various science, and of great ability and experience in the art of military fortification; and twelve topographical Engineers, with six surveyors, were subjected to the order of the Board, with instructions to make an immediate reconnoissance of the country between the "*tide waters* of the Potomac," and the "head of the steam-boat navigation of the Ohio," and "between the

“ Ohio and Lake Erie, for the purpose of ascertaining the practicability of a communication between those points ; of designating the most suitable route for the same ; and of forming plans and estimates, in detail, of the expense of execution.” The Chief of the Engineer Department closed this order, of the 31st of May, 1824, by suggesting “ that it was very desirable the report should be received, “ on this line of communication, in time to be submitted to Congress “ at their next session,” and instructed the Board to use every possible exertion to effect that object.

The first Report of the Board was submitted to Congress, by the President, on the 4th day of February, 1825. It not only placed beyond doubt the practicability of conducting a canal, with a sufficient supply of water, across the Alleghany, by the route of the new charter, on which the principal Engineer of Virginia, and the civil Engineers of both Maryland and Virginia, had made a favorable report, sanctioned by the Commissioners of those States ; but ascertained, with like certainty, the possibility of extending this communication, with much greater facility, from Pittsburg to Lake Erie.

As the Report of the Board was not designed to supply an estimate of the probable cost of any part of the Chesapeake and Ohio Canal, it afforded no answer to a very natural inquiry of every subscriber to its stock, and the motive for delay still continued on the part of the Commissioners deputed to open books for subscription. This motive was confirmed by the intimation that the Board were about to extend their survey and estimates throughout the entire valley of the Potomac, or the eastern section of the Chesapeake and Ohio Canal.

The authority to construct this Canal, as far as the Pennsylvania line, was now confirmed by the States of Maryland and Virginia, as well as by the United States, a necessary party thereto, and its chartered route was established by law. Its actual commencement awaited only an adequate subscription to its stock.

It will be believed by the Convention, that, on the part of the Central Committee, every exertion has been made, compatible with the respect due and felt for the able officers engaged in the arduous duty of making these surveys and estimates, to expedite their *reports* and to guide *them* to the objects embraced within the charter.

In the spirit which prompted those efforts, it is to the Committee, as it must be to the Convention, a subject of regret that, while an estimate is furnished of the cost of a Canal, from Georgetown to Cumberland, it is accompanied by no calculation whatever of the probable cost of the residue of the eastern section of the Chesapeake and Ohio Canal, between Cumberland and the Coal Banks of the Potomac, in the report of the Board of Internal Improvement, of the 23d of October last.

Without this estimate, or some equivalent substitute for it, a comparative calculation of the expense and profit of the coal trade upon the eastern section of the canal, cannot be supplied, in the mode contemplated by the Convention ; nor can the survey and estimates be deemed to be complete, for which the active friends of this enterprise,

together with the Convention, their committee, and the Public Commissioners of the States and of the United States, have so long awaited in anxious expectation.

It is due to the Engineer Department, at the same time, to state, that the general result of the estimate of the far greater part of this section, was supplied, as it is believed, at some inconvenience, by the Board, to the Central Committee, during the last Winter.

Without a detailed analysis of the prices of materials and labor, on which it was founded, and startling in its gross amount, this estimate reached the committee at so late a period of the last session of Congress, as to baffle all hope of grounding upon such a basis, without farther assistance, a successful application to the National Legislature, in the few last weeks of a protracted session, for a subscription to the stock of the proposed canal.

In the belief arising from an imperfect understanding of the facts assumed by the Board, in their late communication, that the detailed estimates of the whole of this section might furnish the means of arriving at a more favorable, as well as a more correct result, and be accompanied, before the final close of the session, by an estimate of the cost of the entire canal, the committee availed themselves of the opportunity just then supplied, by the recent act of the State of Maryland, authorizing, on certain conditions, a subscription of half a million of dollars to the stock of the Chesapeake and Ohio Canal, in order to bring the subject before the House of Representatives by a memorial, in which they were joined by the Commissioners of the States and of the General Government.

On this memorial, a favorable report was made to the House, by the Committee on Roads and Canals, which, however, being neither preceded nor accompanied by a further communication from the United States' Engineers, nor indeed printed, before the close of the session, could not be called up for consideration.

In the interim, the Legislature of Pennsylvania, by an act passed at a very late period of their last session, conceded, under numerous conditions, their long withheld assent to the charter. It was designed, if approved by the other parties to the charter, to complete the legal authority to construct the Chesapeake and Ohio Canal, by any route through the territory of that State, to Pittsburg. To some of the superadded conditions, the Committee purpose, hereafter, to call the attention of the Convention. If this act be approved, or modified, so as to be rendered unexceptionable, it will remain for the States of Ohio and Pennsylvania to promote, separately, or to concert together, some practicable scheme for extending the canal, pursuant to the resolutions adopted at the former session of the Convention, from Pittsburg, by the most eligible route, to Lake Erie.

While obstacles, which the Convention did not anticipate, impeded the progress of their extensive enterprise, other routes for certain parts of the proposed canal, extending between the head waters of the Potomac and the Ohio, have been suggested. Two of these, deriving their supply of water, in part, from the same summit level, that of

Deep Creek, look to the south, along the valleys of the Little Kenawha, and Cheat rivers, in Virginia, for their descending lines of connexion with the Ohio; while a fourth, leaving the Potomac about thirty miles below the mouth of Savage, and turning northwardly, reaches a summit level of less elevation than the former, fed by Casselman river, in Pennsylvania.

This last route has received the sanction of the United States' Board of Internal Improvement, in their final report, of the 23d of October last.

All their estimates are made conformable to it, and their decision in its favor serves to account for the absence from that report, of any calculation of the probable cost of a canal along the margin of the Potomac, between the mouth of Wills' Creek and of Savage.

This decision does not, however, in the opinion of the committee, supersede the use of such an estimate; since it is more than probable, if not absolutely certain, that the supply of the single article of mineral fuel, to say nothing of the inexhaustible beds of iron ore, and of the extensive forests of valuable timber, on the North Branch of the Potomac, would amply repay, in time, the work of the entire eastern section of the Chesapeake and Ohio Canal.

Whether this section shall be conducted above the mouth of Wills' Creek, for any other purpose than that which has been described, and the general commerce to be drawn from the country at its western extremity; or be altogether superseded by the recently discovered route from Cumberland by Wills' Creek, to the mouth of Casselman's river, is a question to be decided by the Company which may hereafter arise under the new charter, although it is one which constituted, along with other considerations, and especially the request of the Federal and State Commissioners, already known to the Convention, a sufficient reason, in the judgment of the Central Committee, for exercising the authority with which they supposed themselves invested, of inviting a reassemblage of the Convention, and an enlargement of its representation.

They were measures calculated, the committee believed, to further the speedy "completion" of the great work confided by the resolutions under which they were appointed, in some degree, to their consultation and management.

The concurrent acts of the three States, and of Congress, from which, with the assent of the Potomac Company to their provisions, the new charter derives its legal existence, now, indeed, control, by the authority of law, the Convention and its committee.

But no doubt can be entertained, but that the same liberal councils which yielded to the memorials of the Convention a charter of incorporation to the Chesapeake and Ohio Canal Company, would lend a favorable ear to similar memorials, for such amendment of that charter as its beneficent purpose may require.

While the committee feel it incumbent upon them to admit the force of the argument submitted by the very able report of the United States' Board of Internal Improvement, in favor of the more northern

route, from Cumberland to the mouth of Casselman's river, for the main canal : they are not prepared to recommend to the Convention an abandonment of that portion of its eastern section which extends from Wills' Creek along the Potomac, by the Coal Banks, to Savage.

The Board appear to have weighed, impartially, the relative advantages of both routes for a canal across the Allegany by Savage, and by Wills' Creek, and to have compared them in their most essential particulars. Their demonstration that the Wills' Creek and Casselman's route will be less expensive by more than half a million of dollars, than that by the valleys of Savage and Deep Creek ; its supply of water nearly the same ; its location more secure from accidental injury or suspension ; its summit level less elevated, by 436½ feet, and less liable to be obstructed at its extremities ; and its actual length shorter by 18 miles ; is entitled to very serious consideration, and would justify, of itself, an application to the competent authorities, so to amend the new charter as to leave the future company at liberty to avail themselves of a choice between them. Nor does it seem to the Committee wholly immaterial to notice, in this view, that the inconvenience of a much lengthened tunnel, which constitutes the chief objection to the northern route, whenever the growing commerce of the Eastern and Western States shall both warrant and require such expense, may be obviated, in a great measure, by a parallel tunnel, excavated and ventilated by means of the shafts of the first, without interruption to the use of the canal during its construction ; and that this additional tunnel may be supplied with an additional quantity of water, by a feeder, also costly indeed, but not impracticable nor difficult of execution, drawing its supplies from the more elevated reservoirs of the Deep Creek summit, to that which the Board of Engineers have preferred ; or, if to this remote and contingent expenditure, it be objected, that it would be better economy to incur the immediate cost of a tunnel sufficiently wide for the boats to pass each other within it, from opposite directions, the comparative cost of both these remedies of the inconvenience and delay of a tunnel admitting the passage of boats in but one direction at a time, would deserve to be maturely weighed. The addition of ten feet to the breadth of the tunnel at the water line, with another tow-path of five, would double the use of this part of the canal, by permitting its boats to pass through it, at the same time, in opposite directions, and by greatly diminishing the resistance of the propelling power, favor the velocity of their motion, and allow their more speedy passage.

But neither the Convention, nor the parties to the new charter, nor the company to which it may give rise, will be required to make an immediate choice between these routes, except in the event, rather to be hoped than very confidently expected, that the sum necessary to complete the whole canal shall be immediately subscribed, and its execution, through its entire line, be instantly commenced. If the several parts of it be accomplished seriatim, a preference is due first to that portion of it which shall connect the coal banks with the navigable waters of the Chesapeake ; next, to that which shall shorten

the portage between the Eastern and Western waters ; and, last, to the intermediate mountain section, which shall finally unite them.

This order of the completion of the entire canal will accord, moreover, with the views of those friends of this central communication between the Eastern and Western waters, who deem it expedient to substitute inclined planes or railways, or both, with fixed and movable steam engines, for a canal across the Allegany mountains. Time, and the light of experience, which the wide diffusion of the spirit of internal improvement is about to shed upon the relative advantages of canals of great lockage, and railways, may clear up the obscurity which now rests upon this new subject of controversy, before the arrival of the Chesapeake and Ohio Canal at the base of the Allegany, shall require its decision.

But if, as the United States' Board of Internal Improvement appear already inclined to determine, it may hereafter be considered expedient to substitute, for what they term the middle section of the Chesapeake and Ohio Canal, an iron railway, a part of their argument in favor of the northern route from Cumberland must be surrendered, since, with a lower summit level, it has a mountain of higher elevation at the tunnel, by near two hundred feet, to contend with, than that, upon the southern route, by Savage river.

All that this reasoning, therefore, tends to enforce, in its application to the present purpose of the Convention, is, the policy of leaving the future Canal Company at perfect liberty, of the various routes and expedients for obviating their greatest difficulty, to select the best.

It will suffice, then, for the present, so to amend the new charter, as to authorize, at the discretion of the company which may arise under it, a limitation of the western end of the eastern section of the canal to Cumberland, on the Potomac ; the substitution, in like manner, in any part of its route, thence, towards its western termination, of inclined planes and railways, for a continued canal, and the power to vary its route, from Cumberland, in any direction suitable to a connexion of the Ohio and Potomac, by a navigable canal, or railway ; retaining to the company, however, in case the northern route for the main canal shall be preferred, the power of reaching the Coal Banks at the mouth of Savage, by another canal of reduced dimensions.

In one view, it is perhaps not to be regretted that the new charter did not originally embrace this authority ; since it might only have distracted the public attention from a route then known, and still admitted to be practicable, and the further examination of which has ascertained the possibility of gathering in ample reservoirs at a level four hundred and thirty-six feet and a half above the Wills' creek summit, even more water than the Casselman's river and its tributaries can supply, and at a distance from the latter of little more than fifteen miles, along which, as well as the feeders that connect the double reservoirs of each summit, a supply of water might be conducted from the higher to the lower summit, without either absorption, leakage, or evaporation, if to remedy a deficiency of water be its only purpose, in subterranean pipes or cylinders of iron, at comparatively moderate cost.

Another act of justice is due, and cheerfully rendered, by the committee, to the United States' Board of Internal Improvement, in reference to that part of their scientific report which relates to the breadth and depth, or the dimensions of the transverse section of the proposed canal.

This view of its structure must indeed be included in "that comparative view of its probable cost and utility, which enters into every rational calculation of profit made by the subscribers to its stock, or of the means of defraying the expense of its construction.

A principle in the experimental philosophy of navigation which was not known to the Convention, when, after some investigation, they limited the breadth of the canal, by their resolutions, to a minimum of forty feet, and its depth, to a minimum of four feet, being the breadth and depth of the New York canals, is supplied by the report of the United States' Board of Internal Improvement. They confirm the expediency of that limitation, and recommend an enlargement beyond it, of the transverse section of the canal, as the charter was designed and is calculated, should expediency warrant it, to admit.

The greater resistance encountered by the boats which navigate the Schuylkill canal, compared with that which they meet upon the broader surface of the river, had disclosed to vulgar observation this principle, in itself so obviously accordant with reason, but the experience of the United States had not supplied the precise measure of its influence upon canal navigation. The Board of Internal Improvement have applied the experimental knowledge of France to demonstrate, with irresistible force, "that the cross section of a canal," in order to avoid the resistance of a confined surface, "ought to be, with moderate velocities, $6\frac{4}{10}$ times the cross section of the boat, and the water line" of such surface or canal, "four and a half times the breadth of the boat."

"Allowing $13\frac{1}{2}$ feet for the breadth of the boats to be used upon the "Chesapeake and Ohio Canal (which is the breadth of the Erie and "Ohio Canal boats) and their draft to be three feet, it follows that "the water line should be $60\frac{3}{4}$ feet, being four and a half times the "breadth of the boat, to enable it to move along the canal with a resistance not exceeding that which it would encounter on an indefinite expanse of water."

For the sake of economy in the construction of the Chesapeake and Ohio Canal, the Board recommend, however, a breadth of forty-eight feet, and a depth of five feet water; and they infer that, on such a canal, compared with one of forty feet breadth and four feet draft of water, with "a gain of about seven per cent. of towing power," in favor of the former, "the weight which may be transported on the broader surface, will be one-third greater than that which may be transported during the same time, that is, with the same velocity, on the forty feet surface." From these facts and principles the Board deduce this interesting conclusion, that, on the Chesapeake and Ohio Canal, in length $341\frac{3}{4}$ miles, having a lockage of 3,158 feet, but with a breadth

of forty-eight, and a depth of five feet of water, the same tonnage may be transported in the same period of time, with the same towing or propelling power, and, therefore, at the same cost, as on a canal of the same length, with a lockage of no more than 600 feet, but of the breadth, at the water line, of forty feet only, with a depth below it of but four feet.

The difference of resistance offered by these different volumes of water, to a boat passing through them, being equivalent to a difference of 2,558 feet of lockage upon a line of 342 miles of canal, allowing a minute's delay per foot of perpendicular lift at each lock. The length of the Western Canal of New York is 362 miles : its lockage is 688 feet. A given tonnage, therefore, being required to be transported from Albany to Buffalo, by the Erie Canal, and from the District of Columbia to Pittsburg, by the Chesapeake and Ohio Canal, having a depth of five feet and a breadth of forty-eight feet, it would arrive at its destination in less time, and, being propelled by the same force, at less cost, also, on the latter, than on the former canal.

While, however, this conclusion, founded on the certain deductions of experimental philosophy, exhibits in a strong light the expediency of resorting to the broader and deeper canal, if regard be not had to the greater cost of its construction : the profitable results of the small canals of England, to the capital invested in the structure, and the counties and cities whose commerce they facilitate, alike demonstrate their vast superiority to the best turnpikes ; and the magnitude of the first expenditure on so extensive a work as the Chesapeake and Ohio Canal, deservedly received the consideration given to the manner of constructing it, by the commissioners deputed to receive subscriptions to its stock.

In regarding its practicability, as well as its future utility, its construction must have reference to its *cost*, as *that* must, of necessity, have a like reference to the means of defraying it.

While the Central Committee render every just tribute to the labor, learning, and ability, displayed by the United States' Board of Internal Improvement, in their late reports, they are led by their own experience, and by information derived from sources entitled to the highest respect and confidence, to question the accuracy of such portions of their tables of estimates, as present to the judgment, facts, occurring daily, within the sphere of common observation, rather than in the paths of scientific research ; such are the wages of labor, and the prices of the materials required for the construction of those parts of a canal which resemble the ordinary works of the coarsest arts in the country adjacent to the line of the canal : such, also, are the quantities of labor which can be performed on such works, by ordinary artificers or laborers, in a given time.

To ascertain these particulars, by inquiries from a source in which the Board and the public could not but confide ; from men of integrity and experience, most cognizant of them from their places of abode and their daily pursuits, and whose authority would be conclusive on all the doubtful topics of estimate ; constituted, indeed, one of the ob-

jects which prompted the Central Committee to invite the Convention to reassemble in the city of Washington, and to extend that invitation to the counties and other corporations interested in the end of its deliberations, and who were unrepresented at the former meeting. Among a body so constituted, and a People previously apprized of the objects of their approaching re-union, there must exist many individuals who derive from their own observation, or come charged with the results of the experience of others, as to the details of an estimate of the probable cost of the labor and materials required for the very simple purposes of excavating, embanking, walling, and paving a canal, and fencing along its border.

The quantity of each species of this work, to be executed on any section or subdivision of the canal, depends, indeed, on estimates founded on a scientific application of the structure of the canal to the ground along which it is designed to extend it, and the quality of that ground; but the quantity being ascertained, and the manner of its execution determined, science has performed its office, and common experience, combined with an actual acquaintance with the resources of the country, must do the rest.

Confining their remarks, for the present, to the estimates of the eastern section of the canal, which the Board propose to terminate at Cumberland, the distance of 186 miles from Georgetown, it appears that they have computed the cost of that section at \$8,177,081 05, for excavation, embankments, walling, lockage, aqueducts, culverts, bridges, puddling, paving, dams, waste weirs, and gates, fencing, basins, and certain items not reducible to any general head of expenditure, but few in number, and amounting, together, to an inconsiderable sum.

Of the specific heads, the five, first mentioned, cover near seven-eighths of the total cost of this section, in the proportions :

For excavation, of	-	-	-	-	\$2,515,176	46
embankments,	-	-	-	-	685,456	11
walling,	-	-	-	-	2,737,808	68
lockage, including guard locks,	-	-	-	-	997,300	00
aqueducts,	-	-	-	-	521,696	00

Being a total amount of	-	-	-	-	\$7,457,437	25
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Of the residue, or \$719,643 70 of the estimated cost of this section, culverts, bridges, puddling, paving, and fencing, make up the sum of \$532,109 11 more, leaving, for miscellaneous items, \$178,534 59.

The lowest price allowed for excavation is 14 cents the cubic yard, and the highest \$1 65. The price per cubic yard for embankments varies between 12 and 42 cents. Of walling, 31 miles, the cost is from \$3 to \$5 18 cents the cubic yard, which makes the cost per mile, in lineal extent, average more than \$88,000. The lifting locks are computed, throughout, at \$1,500 the foot lift. The masonry of the aqueducts, it is presumed, according to the same data. The pud-

ding, amounting to \$122,186, at 12 cents the square yard of 18 inches thickness; the paving amounting in cost to \$122,186, at 82 cents the square yard; and 175 miles of fencing, at \$ 900 the mile.

The committee have arrived at some of these results, with some care, and at some expense of time, in reviewing, during the short period allowed them, a work of much labor.

They forbear to anticipate the judgment of the Convention on an estimate adjusted to the compensation of one dollar a day for a common laborer, at work for ten hours, in a country, abounding with the necessaries of life, and already possessing, along the greater part of the line of the canal, some of the advantages of navigation, to equalize their value, and where peculiar causes conspire to check the sudden rise of the wages of ordinary labor; and this price, extended to its humblest offices, is, moreover, augmented for the attendants in the subterranean tunnel, and in employments of like exposure.

In an estimate, believed by the committee to exceed in amount the probable cost of this section of the canal, they have reduced these specific expenditures to 5,000,000 dollars, allowing, as part of that sum, four hundred thousand for unforeseen contingencies.

The committee doubt not but that this estimate might be yet further reduced, and that the estimates of the other sections of the canal would admit of a larger ratable deduction, since peculiar errors enter into their formation; as a computation for the tunnels and the reverse arches, at the bottoms of the locks, of hard burnt bricks, of dimensions reduced to eight inches in length and two in thickness, but of four inches breadth, at \$ 5 per thousand, on a supposition that but 60,000 of such bricks could be supplied by a kiln of 100,000 burnt in a country where wood is a nuisance; that common limestone does not exist, because it does not appear on the surface of the earth; and that lime, for water-proof cement, cannot be had nearer than the Canal of New York, although it had not been searched for in the country most requiring its use; and it has, in fact, the committee is credibly informed, been since discovered there in great abundance, on the margin of a Western river.

These errors, if they are such, in a very able and valuable report, do not affect, in any degree, the merit of its authors as scientific men, nor are the committee prompted to note them, but by an imperious sense of duty.

To the unassuming personal and moral worth, and to the indefatigable industry of the distinguished member at the head of the Board of Internal Improvement, they unite with their fellow citizens in according the well-earned meed of public applause, nor do they withhold their thanks from his coadjutors in a work of equal labor and skill. The Board have failed only where less ability was competent to the task which they have endeavored to perform, under impressions, perhaps, that the work, which they estimated, would readily command the wealth of a nation for its construction, and with feelings which would be less wounded by the discovery that they had under, rather than overrated its cost.

Of their errors, it should also be remarked, that, in the patient and ingenious analysis of their constituent elements, the Board have afforded an easy corrective, since they have left nothing to be supplied by those who follow them, but the labor of common sense, guided by the knowledge of common experience.

In one of the estimates, submitted to the Convention in 1823, the transverse section of the Chesapeake and Ohio Canal was assumed to be, at the water line, 40 feet, at the base, 28 feet, with a depth of four, which, multiplied by the mean breadth, between them, gave a surface of 136 square feet; while the canal, estimated by the Board, having a mean breadth of 40.5 feet, and a depth of five feet, has for its transverse section below its water line a superficies of 202.5 square feet in extent, and would cost, for excavation alone, according to the estimates of the Board, \$838,000 less than that which they have recommended, and this without any reference whatever to several circumstances in the ground over which the two canals would pass, tending much to augment the cost of that which has the greater breadth.

It was, therefore, with a prudent regard to the practicability of obtaining funds for the accomplishment of this great work, that the Federal and State Commissioners have forbore to open books for the subscription of its stock, not only until the estimates of the Board had been received, but until some calculation might be made of the extent of the aid that may be derived from those sources of wealth, on which a work of such vast political importance naturally relies for the means of its execution.

While the private subscriber to its stock, may, indeed should be expected to regulate the amount of his subscription to such an enterprise, by a consideration of its immediate or remote returns in the shape of dividends or profit; while the cities, whose trade may be advanced by it, shall blend with this consideration, that of the augmented value which its success must bestow upon their fixed and active capital;—the States so deeply interested in it, may be expected to regard this prospective income, as of inconsiderable moment, compared with the internal resources which so extended a line of inland navigation must promptly develope—the wealth which it must generate, employ, and enlarge—the population which it must attract, fix, and multiply;—and the Government of the United States, strong as is its obligation to the District of Columbia, of which the founders of the Federal Republic have constituted it the paternal guardian, must more sensibly feel that, by the accomplishment of such an enterprise, a new momentum will be imparted to its defensive power, whether exercised upon the land or the sea, and an indestructible bond provided for the Union, and with it the prosperity of the People, for whose security, freedom, and happiness, it was instituted.

Whether the powerful appeals which these interests and obligations address to the councils of the States and of the Union, shall be successful, futurity only can determine. It is for the Convention to hasten its favorable decree, by presenting to those councils, the ardent wishes, the just hopes, and the confident expectations, of their numerous constituents.

If, with the Government of the United States, the acquisition of wealth were an exclusive object, it is believed, that, in the rapid appreciation of the public property in this District, and of the public lands to the West, which would follow the completion of the Chesapeake and Ohio Canal, it would find a sufficient inducement, as a proprietor, for applying a part of its annual revenue, and its credit, to the improvement of its fixed capital.

Already, indeed, a new and improving branch of agriculture, deriving its spring from an access to the markets of the Chesapeake, has enriched a large part of the State of Ohio, and will contribute to double, very speedily, the revenue of the Union, from the sale of those lands. But the customs are alike improveable, as the committee have noticed on a former occasion, by every augmentation of the exported produce of the United States. The returns which are received for them, from abroad, do not merely replace the native value of each exported commodity, but comprehend the freight, mercantile profit, and numerous charges of its transportation; one-fourth, at least, of the whole of which, enters the public treasury; while the consumption of the foreign products that constitute these returns, extending with inland navigation, and the diffusion of newly created wealth, reduces the debentures discounted from the dues of the customhouse.

The committee are conducted by these views to the most interesting topic which they have felt it to be their duty to submit to the Convention, involving an inquiry into the best means of giving effect to the new charter by an adequate subscription to its stock.

The former resolutions of the Convention separated the legal authority to make the proposed canal from the pecuniary means required to give that authority effect. In like manner, do the committee recommend it to the Convention to proceed in endeavoring to obtain such amendments as the new charter may be deemed to require. The only one which has seemed to them necessary, they have already suggested, and of its ready accordance by the present parties to that instrument, there cannot exist a doubt. Pennsylvania has even anticipated the application of the Convention, by authorizing an extension of the canal from Cumberland to Pittsburg, by any route through her territory, which may be hereafter thought most expedient. She has, in the first section of her "Act incorporating the Chesapeake and Ohio Canal Company," assented in the most unequivocal manner to the charter of Virginia. To the 3d, 4th, 6th, 7th, 8th, and 9th sections, which qualify that assent, no material objection arises, in the judgment of your committee. But, if the second section be susceptible of a construction which, by giving as unrestricted a power to any future company to use the waters of Pennsylvania, required for the Chesapeake and Ohio Canal, as the new charter gives to the company that may arise under it, to suggest an error in this act, so palpable, would lead, it is confidently believed, to its prompt correction. For, otherwise, this section must operate as a complete retraxit of all the power that is granted by the first, and the very reservoirs of the summit level, should the route by Wills' creek be preferred, may be

exhausted for the use of some lateral canal, without a violation of the chartered rights of the Chesapeake and Ohio Canal Company. A literal construction, leading to such a result, it is to be presumed no court of justice would technically enforce; but as this act has not yet been accepted by the other parties to the new charter, and is open to easy amendment, the committee have deemed this notice of it expedient, if not necessary.

To the 5th, and only remaining section, more serious objections arise. It is contradictory and subversive of the whole plan of the Convention, digested with much labor and circumspection at their first meeting. To the provision of this section that such part of the stock of the canal company as may be subscribed by the citizens of Pennsylvania, shall be applied exclusively to the western section of the canal, unless the subscribers shall give to their subscriptions a different direction, however inconsistent with the scheme of a joint stock company, less objection might be entertained, if it did not involve a consequence designedly excluded by the charter in its present form; an obligation to begin a work without any security for adequate funds to complete it, and which, while incomplete, must be almost wholly unproductive; and such a division of the funds of the company between the two sections of the canal, as would render it impracticable, perhaps, to finish either before the loss of profit on the unproductive capital actually expended, would be equivalent to that capital.

Such a measure would paralyze all the hopes of success, in this entire work, which are derived from the assured profit of its eastern section, by remotely deferring that profit, and consequently preventing all other subscriptions to its stock.

If such a destination of the Pennsylvania subscription stopped short of this effect, the other branch of the condition expressed in this section would render it inevitable.

The friends of the Chesapeake and Ohio Canal have always relied, for reasons which have been already expressed in this report, and often before repeated, on a liberal participation, by the United States, in the expense of its construction. Without such a co-operation on the part of the United States in this great work, it has been deemed to be impracticable. To conciliate that co-operation, it should be rendered as light a burthen, as it can be made, on the public treasury. If the eastern section of the canal be accomplished, as it may be, in a few years, that burthen will then cease: for the coal trade of the Potomac will be opened as soon as that section shall be finished, and from its profit, the charter promises, not without well-grounded reasons, a part of the resources required for the completion of the western section.

Should the subscriptions, in the first instance, be competent in amount to the speedy completion of the whole canal, then the company which will have been created, are bound by duty, as well as interest, to proceed to its execution throughout. Should they fall short of that extent, the interest of Pennsylvania, like that of every other party to the charter, requires, most imperiously, that the sums actually sub-

scribed, shall be employed so as to yield the greatest immediate profit. In a commonwealth so distinguished in the career of internal improvement, reasons founded on such obvious expediency, it is hoped, will not prove unavailing, and the Legislature of Pennsylvania perceiving, will have the candor to acknowledge, their force, and the liberality to disencumber her assent to a measure of such evident importance to the prosperity of a large portion of her citizens, of a condition destructive of its own purpose.

The Committee propose to vary, to no great extent, the plan of finance which they now proceed to recommend to the Convention, from that which their former resolutions have already sanctioned. They deem it advisable to lay its foundation in an application to the Congress of the United States, to the States who are parties to the charter, and to the cities most deeply interested in the execution of its great purpose, for a subscription to its stock. Individuals would more readily embark in an enterprise which had already received so imposing a sanction, and the vigilance of private interest would serve as a guarantee of the economical and faithful application of the public money.

The committee, pursuing the views which they have already in part suggested, cannot but hope that the superior interest which the Federal Government must feel in the success of the labor of the Convention, and the more abundant resources of revenue and credit which the United States possess for promoting its speedy prosecution, will induce the Congress of the United States to authorize a subscription of one moiety of the stock required for the whole, or, at least, for one section of the canal, under a regulation as liberal as that which constitutes an essential feature of the constitution of the Virginia fund for internal improvement. If a subscription of one moiety of the stock of the Chesapeake and Ohio Canal can be obtained from the United States, accompanied with a condition that such moiety shall be entitled to no dividend or profit, till the subscribers of the other moiety shall have netted five per cent. per annum on the sums which they may have respectively paid into the treasury for the future company, a doubt need not exist of the prompt execution of this noble enterprise. And yet this is less, by one per cent. per annum, than the Legislature of an individual State, with unprecedented unanimity, accorded, not to its own citizens exclusively, but to all capitalists, whether foreign or domestic, who might be disposed to embark their private fortunes in works of great public utility.

What better use can be made of such portion of the common treasure, as is destined to promote the common safety and happiness, than to give it a direction calculated to elicit the wealth of the most sordid private citizen, or of the remotest foreigner, for the same beneficent and noble object? Restricted to the encouragement of new enterprises of unquestionable national utility, such an application of public wealth is founded in wisest economy.

The Central Committee finally close their report by recommending to the Convention the adoption of the subjoined resolutions :

Resolved by the Convention. That it will be expedient to obtain such an amendment to the charter of the Chesapeake and Ohio Canal Company, as shall authorize the company to terminate, if they deem proper, the eastern section of the said canal at or near the town of Cumberland; and to extend, by any route therefrom, the western section of the said canal across the Alleghany to Pittsburg, or to substitute therefor a railway or other artificial road. And, in the event that such a change shall be deemed expedient of the route now prescribed by the charter, to defer the extension of a canal along the Potomac, from Cumberland to the mouth of Savage, and to reduce the dimensions thereof to a breadth less than that now required.

Resolved. That it will be expedient to address a memorial to the Congress of the United States, requesting a subscription to the stock of the said canal: and a like memorial to the Legislatures of Virginia, Maryland, and Pennsylvania, and that an application be made to the cities of Washington, Georgetown, and Alexandria, to aid, by a similar subscription, the stock of the said Company.

Resolved. That a committee be appointed to prepare and submit to the Convention an estimate of the cost of the canal (founded upon the report of the United States' Board of Internal Improvement, of the 23d of October last, to the Department of War.)

Report of the Committee appointed on the 6th of December, 1826, by the Chesapeake and Ohio Canal Convention, to prepare and report an estimate of the cost of the said Canal, founded on the report of the United States' Board of Internal Improvement, to the Department of War.

The Committee have given to the subject their unremitting attention, since the time of their appointment, but find it impossible in the short period allowed them, to make their report as full and as perfect as could have been desired.

They have examined, however, with great care and attention, the able and scientific report lately made by the Board of Internal Improvement, which it is but just to say, reflects great credit on their industry and talents. The great error, however, into which the Board appear to have been betrayed, by a want of accurate local information, is found to consist in the extravagances of the **PRICES** of labor and materials, established as the basis of their estimate, which estimate must of course rise or fall in a ratio corresponding with the increase or diminution of this standard.

The Committee, therefore, with a view as well to test the accuracy of the estimate of the Board as to furnish one of their own, have found it necessary, in the first place, to establish an analysis and table of prices, corresponding to, and contrasted with, that of the Board. This being the most important, so the Committee also found it to be the most difficult and delicate part of their task. They are happy, however, in being able to state, that they have succeeded, with perfect unanimity among themselves, in adopting the following table of prices, which, they trust, will meet the approbation of the Convention.

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Canal.

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Resolved. That a committee be appointed to prepare and submit to the Convention an estimate of the cost of the canal (founded upon the report of the United States' Board of Internal Improvement, of the 25d of October last, to the Department of War.)

Report of the Committee appointed on the 6th of December, 1826, by the Chesapeake and Ohio Canal Convention, to prepare and report an estimate of the cost of the said Canal, founded on the report of the United States' Board of Internal Improvement, to the Department of War.

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The Committee, therefore, with a view as well to test the accuracy of the estimate of the Board as to furnish one of their own, have found it necessary, in the first place, to establish an analysis and table of *prices*, corresponding to, and contrasted with, that of the Board. This being the most important, so the Committee also found it to be the most difficult and delicate part of their task. They are happy, however, in being able to state, that they have succeeded, with perfect *unanimity* among themselves, in adopting the following table of *prices*, which, they trust, will meet the approbation of the Convention.

TABLE.

PRICES ADOPTED BY THE BOARD OF INTERNAL IMPROVEMENT.		PRICES ADOPTED BY THE COMMITTEE.		DIFFERENCE.	
<i>Lime.</i> —Average price for the whole line, per bushel	\$ 0 48	<i>Lime.</i> —Average price per bushel	\$0 18	per bushel	\$0 30
<i>Hydraulic or Water Cement Lime</i> , 60 cents per ditto at Pittsburg—for transportation, 70 per ditto	1 30	At Pittsburg, now delivered of the best quality, from Beaver, (supply inexhaustible,) 18 cents, transportation on Western section, 25 cents	0 43	do	0 87½
<i>Brick</i> per thousand, delivered	6 27	(Few required on the Eastern and Western sections	4 00	per thousand	2 27
<i>Stone delivered</i> , per perch	2 54	Per perch	0 75	per perch	1 79
“ wall built with mortar, per perch	5 38½	On western section 1 62½—Eastern 1 87½, average	1 75½	do	3 62½
“ dry wall built without mortar	3 00	On do do 87½ do 1 12½, do	1 00	do	2 00
<i>Cut Stone Masonry</i> —Cut sand stone for locks, blocks of 9 cubic feet content, per perch	12 46	For same	4 75	do	7 71
<i>Cut lime stone</i> as above	15 32	do	5 50	do	9 82
Ditto not less than ½ of a cubic yard, nor more than one yard, per perch	25 00	same	8 50	do	16 50
<i>Labor.</i> —For common day laborers the lowest estimate is, per day	1 00	same { Western district 50 Eastern do 62½ }	0 56½	per day	0 43½
<i>Brick Work.</i> —For cubic yard 638 bricks for walls	8 36	same	4 00	per cubic yard of	
Same ditto for arches	10 38	same	4 87½	638 bricks	4 36
<i>Water Cement</i> per cubic yard of mortar	21 49	same (Western district)	8 00	do do	5 51
<i>Locks</i> per foot of lift	1,500 00	Locks are built on Ohio Canal for \$420 per foot lift, and on Pennsylvania Canal for \$400, 90 feet long, 16 feet wide, and 4½ deep; add \$100 per foot to increase their size to that of the Chesapeake and Ohio Canal, viz: 102 feet long, 16 wide, and 7 deep	500 00	per cubic yard	13 49
				per foot	1000 00

Excavation.—By comparing the estimated cost of excavation with the prices paid for similar work on the Ohio Canal, and Western section of the Pennsylvania Canal, it appears that the estimate of the Board is, generally, in reference to the various species of excavation, more than double, and frequently three times the amount there paid.

unanimity among themselves. in adopting the following table of *prices*,
which, they trust, will meet the approbation of the Convention.

In establishing these prices, the Committee had recourse to the following sources of information :

- 1st. To the prices *actually paid*, for labor and materials on canals now in progress both east and west of the mountains ;
- 2d. To numerous reports of Committees appointed along the immediate line of the canal, to collect facts and information on the subject ;
- 3d. To the personal knowledge and observation of the members of the Convention, engineers, and others, from whom much valuable information was derived ;
- 4th. The actual cost of similar works, executed in the immediate vicinity of the Chesapeake and Ohio canal route, where all the circumstances, the labor, materials, and local facilities, are the same ;
- 5th. Offers made by responsible men to give security and execute the work. All these tests, the committee are happy to find, concur in establishing the *prices* they have adopted, and in proving, conclusively, that the work can be performed for about one-third part of the estimated cost.

And, finally, from the analysis detailed by the Board, of the prices on which their own estimate is grounded, the committee have inferred the source of the error of that estimate, and sought to harmonize the results of these facts, and of common experience, with the reasoning of the Board.

The foregoing *prices*, adopted by the Committee, in reference to the most important items, generally amount to about one-third part of the prices adopted by the Board, but almost invariably to much more than the prices now paid on the Ohio and Pennsylvania Canals, as appears by the following

TABLE OF PRICES.

	Ohio Canal.	Penn. Canal.	Adopted by Comm.	By Board.
Lime, per bushel, <i>average</i>	\$0 11	\$0 11	\$0 18	\$0 48
Hydraulic or Cement Lime, per bushel	15	25	43	1 30
Stone Walls, dry, per perch, <i>average</i>	44	48	1 00	3 00
Do. do. with mortar, do. do. . . .	1 75	1 62½	1 75	5 38½
Cut Stone, for Locks, per do. do. . . .	4 00	3 75	6 42	14 26
Labor, per day	40	40	56½	1 00
Locks, per foot lift	420 00	395 00	500 00	1500 00*

* These contracts were made some time since ; more recently the prices have fallen from 10 to 20 per cent. on the Pennsylvania Canal, and from 5 to 10 on the Ohio Canal.

Excavation.—The cost of excavation of the various kinds of earth and rock, varies, on the Ohio and Pennsylvania Canals, from $5\frac{1}{2}$ to 50 cents per cubic yard, while the estimate of the Board varies from 14 to 160, the difference being generally about as 1 to 3.

In the second place, the Committee beg leave to present, in support of their estimate, the results of various reports of Committees, appointed during the last Summer, along the route of the Chesapeake and Ohio Canal, whose especial duty it was made to collect facts, and accurate information, as to the prices of labor, materials, &c. These all concur in demonstrating that the prices adopted by the Committee are too high, rather than too low.

The average results produced by a comparison of these reports are as follows :

Lime per bushel	10 cts.	Committee adopt 18 cts.	
Stone Wall, dry, per perch	68	do	do \$ 1 00
Do. with mortar	\$ 1 50	do	do 1 75
Brick per thousand	3 43	do	do 4 00
Labor per day	50	do	do 56 $\frac{1}{2}$

These reports also establish other important facts, viz : That *Stone* of the best quality can be easily procured on the immediate line of the Canal ; that abundant quarries of *Lime Stone* are found at convenient distances ; that *Stone Coal*, from numerous and inexhaustible banks, can be delivered in boats on the Canal, west of the Alleghany Mountain, for from two to four cents a bushel ; and it is a well known fact, that, in many places in that country, banks of Coal from 12 to 15 feet in thickness will be penetrated and opened by the canal, for miles together ; that iron ore and timber of the best quality also abound in inexhaustible quantities, and that a number of salt works are already in successful operation, and that many others may be erected, on the margin of the proposed Canal.

Silly. Still further to demonstrate the extravagance of the estimate of the Board, as well as to establish, more satisfactorily, the correctness of their own, the Committee instituted a comparison of the cost of the first section of the Pennsylvania Canal, now in progress, up the Alleghany river, with the like section of the Chesapeake and Ohio Canal, up the Monongahela ; both commencing at Pittsburg, and passing over similar ground through the same country, where the prices of labor, materials, provisions, &c. are the same. Where it is found that the Pennsylvania Canal actually costs less than \$9,000 per mile, while the Chesapeake and Ohio Canal is estimated, by the Board, at \$43,000 per mile, though passing through a country possessing great advantages,* and requiring only $2\frac{1}{2}$ feet of lockage per mile, the walling computed at only \$800, and the culverts, bridges, puddling, and waste weirs, at \$701 per mile. The *excavation* alone, being estimated at \$29,573 per mile, or more than *three* times the

* The lime employed in the construction of the Pennsylvania Canal, delivered at 11 cents per bushel, is actually made on the line of the Chesapeake and Ohio Canal, and transported to the other.

whole cost of the Pennsylvania Canal, (only a few miles distant,) and at more than $4\frac{1}{2}$ times the cost of the Ohio Canal, the cost thereof being less than \$6,460 per mile.* And, after adding \$2,000 to the actual cost of the Pennsylvania Canal, a sum sufficient to enlarge its dimensions to those proposed for the Chesapeake and Ohio Canal; still, with this addition, its total cost will be very little more than one-fourth part of the estimated cost of the latter. This difference is, however, readily accounted for, when we advert to the fact, that the *walling*, which is estimated on the one at \$3 40 per perch. is executed on the other for 40 cents!! and the excavation which costs but six cents per cubic yard on the Pennsylvania Canal, is estimated, by the Board, on the Chesapeake and Ohio Canal, at 17 cents.

The Committee, in presenting this view of the subject, it will be perceived, do not rely upon conjecture, but upon facts established and ascertained beyond all doubt; which demonstrate that the Western section, at least, of the Chesapeake and Ohio Canal, can be executed for less than the one-third part of the estimate of the United States' Board of Internal Improvement.

This result is established by a reference to contracts recently made upon the spot, for similar work, yielding a handsome profit to the undertakers, and where the competition, instead of enhancing the price of labor, (according to the hypothesis of the Board,) has reduced it; so that the second contracts have been taken at from 10 to 20 per cent. less than the first.

4th. Could further proof in support of the views already presented by the Committee be required, they would refer to offers made in writing, by General Lacock, now a Commissioner on the Pennsylvania Canal, and David Shriver, Esq. late a member of the United States' Board of Internal Improvement, both practical engineers, and gentlemen of wealth and respectability, who proposed to make the canal from Cumberland to Georgetown, (186 miles) for $2\frac{1}{2}$ million of dollars, or less than one-third of the estimate, viz: \$8,177,028. This offer amounts to about \$13,440, and the estimate to about \$44,000 per mile. General Lacock has recently made an additional offer, to make *one hundred miles*, of the western and middle sections, according to the plan and dimensions of the Pennsylvania Canal, for \$1,000,000, being \$10,000 per mile. This part of the canal is *estimated* by the Board, in their report, at about \$5,245,000, being \$52,245 per mile, or more than *five* times the amount of General Lacock's offer, for the performance of which offer, he says he is prepared to give ample security. The Pennsylvania Canal is 40 feet wide, $4\frac{1}{2}$ deep, with locks 90 feet long and 16 wide; while the Chesapeake and Ohio Canal is proposed to be made 48 feet wide, and 5 deep, with locks 104 feet

* A survey and estimate has recently been made by an experienced Engineer in New York, of a Canal to unite the Alleghany river in Pennsylvania, with the New York Canal, 102 miles in length, with an average of 13 feet of lockage per mile, which is estimated to cost 5,886 dollars per mile, while the Chesapeake and Ohio Canal, with an average of only $9\frac{1}{2}$ feet of lockage, is estimated by the Board of Engineers to cost 64,516 dollars per mile, about eleven times the estimated cost of the other, with an average of one-fourth less lockage per mile.

long and 14 wide. From a calculation made by competent engineers, \$2,000 per mile, it is believed, would suffice to defray the additional expense required to enlarge the dimensions of the Pennsylvania, to those proposed for the Chesapeake and Ohio Canal; which sum, added to the offer of General Lacock, would amount to only \$12,000 per mile, or less than one *fourth part* of the estimate of the United States' Engineers; and from the high standing of the gentleman making this offer, no reasonable doubt can be entertained, but that the work can and will be executed for this sum, should the offer be accepted; thus, 286 miles of the Canal, estimated at upwards of \$13,400,000, will be completed, on the plan of the Pennsylvania Canal, for \$5,500,000; or, on the plan proposed by the Board of Engineers, for about \$4,072,000, being considerably less than one-third of their estimate, and leaving, on what they denominate the middle section, only fifty-five miles of Canal, or a portage of 22 miles to complete the entire route.

5th. The next corrective applied by the committee to the estimate of the Board is derived from the *prices* paid for labor and materials at the Capitol, by Mr. Elgar, the Superintendent of the Public Buildings.

At the Capitol, *Lime*, made at Thomaston, Maine, transferred 640 miles, 43 cents per bushel—Estimate of the Board of Internal Improvement 48, for the whole line—Difference 5 cents.

At the Capitol, *Labor*, per day, (good hands) 75 cents—Estimate of the Board, 1 dollar, lowest rate—Difference 25 cents per day.

“ *Masonry, Stone Wall*, with mortar of best materials and workmanship, \$2 62½ per perch—Estimate of the Board, \$5 38½—Difference, per perch, \$2 76.

“ **Dry Wall*, without mortar, stone from the Potomac, five miles, \$1 87 per perch—Estimate of the Board, \$3 72—Difference, \$1 84.

“ *Dry Wall*, stone on the spot, 75 cents per perch—Estimate of the Board, \$2 77—Difference, \$2 02.

“ **Excavation*, per cubic yard of earth, transported

	Excavation.	Walling.	Total.
* On the Eastern section,	\$ 2,515,475	\$ 2,737,808	\$ 5,273,283
Middle do.	2,797,489	3,184,723	5,982,212
Western do.	1,800,213	712,444	2,512,457
	\$ 7,113,177	\$ 6,634,975	\$13,768,152

In the Eastern Section, average cost per cubic yard of excavation, - - \$00 26
walling, - - - - 3 09

In Western Section, excavating, - - - - 0 25
walling, - - - - 3 63

200 yards, (11 to 13 cts.) 12 cents per cubic yard
 —Estimate of the Board, 42 cents*—Difference 30 cents.

Thus it would appear, from the prices now paid at the Capitol, that the materials could be furnished, and the whole work executed in the Capitol yard, for a sum vastly short of the amount required by the estimate of the Board, to construct the canal through the interior of the country, where the materials are mostly on the spot, and labor and provisions are to be had at the lowest rates, and in the greatest abundance.

Thus, whether the estimated cost of the Chesapeake and Ohio Canal be tested by the actual cost of other canals now in progress, over similar ground in the same vicinity, or by the offers of responsible and experienced Engineers to execute the work, the same result is produced: that the work can be done for less than one third of its *estimated* cost. Or, if we compare the *prices* the Board have adopted as the basis of their estimate, with the prices now paid for similar work on the Ohio and Pennsylvania Canals, both east and west of the mountains; or, if it contrasted with the prices reported by the committees along the line of the canal, or with those adopted by this committee; still the results of all these comparisons concur in establishing the same general position, that the work can be contracted for and executed for *one-third part* of the estimated cost.

On a retrospect of the facts supplied to the Committee, and by them presented to the Convention, from so many and such various and respectable sources, the result of the comparison which they have enabled the committee to institute, between the cost of a canal of the dimensions recommended by the United States' Board of Internal Improvement, in conformity with the estimate of the Board, and the cost of the same canal at the reduced estimate of the committee, must be to the Convention, and will be to the public, a subject of no little surprise. It was alike so to the Committee, and constituted an additional motive for the vigilant exercise of that circumspection which the peculiar nature of their office required, as well as the delicate circumstances under which they have been called to act. They could not but be aware that any conclusions at which they might arrive, would be regarded as those of the zealous friends of an enterprise of unparalleled magnitude and importance, to promote which the members of the Convention have themselves reassembled; that if those conclusions differed materially, as they evidently do, from those of the very able and scientific report on which a resolution of the Convention requir-

Middle Section, for excavation, per cubic yard,	-	-	-	-	\$0 58
walling,	-	-	-	-	5 23
For whole canal, average cost of excavation	-	-	-	-	32
For walling, (exclusive of locks, bridges, aqueducts, culverts, &c.)	-	-	-	-	3 93
or, per perch, of 25 cubic feet,	-	-	-	-	3 64

* The Board estimate the cubic yard of earth, carried 40 yards, at 14 cents, to which they add 7 cents for every additional 40 yards, amounting, on 200 yards, to 42 cents the cubic yard.

ed the Committee to found their estimate, they would have to encounter the weight of high professional authority sustained by unimpeachable integrity, and enhanced in its influence by the absence of the slightest suspicion of any unworthy bias.

The Committee deem it, therefore, a cause of congratulation to the Convention, that the nature of their disagreement from the Board, is so obvious, as to preclude a doubt of its origin; and that origin so simple in itself, as to be susceptible, wherever the error may lie, of the most certain and prompt corrective.

By resolving the prices of the various species of labor and materials, required for the construction of a canal, into their constituent elements, the Board afford an unerring guide to the application of this corrective; and further, demonstrate that, if the Committee have arrived at results so different from their own, it is only because they have set out with such different facts. To the evidence therefore accompanying this report, of these facts, and to the facts themselves, the Committee confidently appeal to sustain their deductions. In a branch of practical science, they refer to the decision of that experience which, and which only, is competent to determine the correctness of their estimates: and from the judgment of this impartial and infallible arbiter, there can be no appeal to a higher authority.

But in justice to the Board, it may not be amiss, and, to the Convention, it may prove satisfactory, yet farther to examine that analysis of prices from which the Board have derived their extraordinary estimate.

As, in all the work of a canal, except the construction of the locks, aqueducts, bridges, and culverts, but more especially in simple excavation, embankment, walling, and paving, which constitute so large a proportion of its entire cost, common labor, assisted with very little skill, is the chief, indeed almost the sole element of value, the Committee invite the attention of the Convention to this item of the estimate of the Board, as it is presented in their analysis. The Board here compute a month's labor at "22 effective days," out of thirty, the supposed duration of the month; its wages, at \$ 12 : its subsistence, at \$ 8 57, or two dollars per week : being more than \$ 106 27 for the year, of 365 days : and, allowing for whiskey two cents the day, and for accidental lost time four cents, they raise the price of the effective day's labor to one dollar.

In this analysis each element is involved in error. Custom computes the month's labor at 26 effective working days : which, added to four Sabbaths, make the nominal month of thirty days. The loss of time from ill health, rains, and accidents, befalling the laborer, is borne by him. His wages will be found to vary between six and ten dollars, averaging eight for the month; his subsistence, comprehending his whis! 67, not to exceed four dollars, or five at most. The sum allowed for this last item, by the United States' Engineers, equals, if it does not exceed, the cost of board in some of the most expensive Universities and Colleges of the several States, and, in many of the best hotels and boarding houses in the largest towns of the

several counties through which the intended canal will probably pass.

It is understood that the Board of Engineers have considered any possible over estimate of the *price* of a day's labor of 10 hours, employed in excavation, as made up by an excessive allowance for the *quantity* of work supposed to be done in the day. This would be deriving an apology for one inaccuracy, by the admission of another, if the fact of the contract price of excavation per cubic yard had not, in various instances, brought experience to testify to the contrary.

Moreover, this excessive estimate is applied to all the other offices of ordinary labor, the lightest as well as the heaviest; not only to that of excavation, but to the attendance upon the masons, and, it is presumed, to the drivers of carts engaged in transportation. The allowance of a single horse, cart, and driver, being as much as 188 cents. In the excavation of the entire tunnel, twelve and a half per cent. is superadded to the dollar on account of the peculiar nature of the work; and yet the hands that labor in the coal pits near Richmond, in Virginia, not only involved in darkness, but exposed to wet, become fond of their occupation on account of the moderate temperature to which it exposes them in the extremes of both Summer and Winter.

The Board, moreover, make no allowance, whatever, for cheapening the cost of excavation, by substituting the scraper and the plough, dragged by horses or oxen, for the manual labor of the spade, the pick, and the shovel.

In the same analysis, they compute the lowest cost of simple excavation, that of loosening and throwing into a cart or wheelbarrow, the lightest earth, at six cents and eight-tenths of a cent per cubic yard; and yet, in their tables of prices, they have not extended one single cubic yard of excavated earth at less than 14 cents. They allow, it is true, for transportation, to the distance of 40 yards upon a level, or of 30 yards on an ascent of $\frac{1}{12}$; 6.8 cents, or a sum equivalent to the cost of excavation; and a like amount for each additional stage of forty yards of like transportation: but, it cannot be presumed that every shovelful of earth must be removed, for forty yards, in a cart or wheelbarrow; and, if so, the cost of such excavation should be 13.6, not 14 cents. That this is not an average price, the table of excavation for the eastern section of the Cheapeake and Ohio Canal, compiled by the committee, demonstrates. The eleven tables of the Board, comprehended in this exhibit, comprise, under the head of excavation, in the same columns of prices, no less than twenty-one different values, beginning with 14 cents, and ending at 160 cents the cubic yard. The table of the committee demonstrates that 2,596,941.8 cubic yards of excavation, upon this section, are estimated at 14 cents each; and that, being the lowest estimated excavation, by a reference to the analysis, it must consequently be of "light earth, sand, and clay, or alluvial bottom:" much of it must be found on the extensive alluvial low grounds of the Potomac river.

composed of soil capable, in part, at least, of being pitched by the shovel upon the adjacent banks of the canal, with the cast of the hand; and much, if not the whole, of being removed out of the way by the plough and the scraper; or, as has been practised on some of the canals of Europe, by wheelbarrows moving on inclined planes, guided by the hand, and drawn up by a single application of the power of horses.*

The excavation, alone, of so much of the eastern section of the Chesapeake and Ohio Canal, as extends from Cumberland to Georgetown, is computed at \$2,515,477 56, being an average of 25.8 cents per cubic yard, on 9,745,934.00 cubic yards. In the form in which the tables of the Board present this estimate, a comparison of this particular item of expense, with the same on other canals already finished, or in execution, is impracticable. An approximation only can be made to it, by referring to the cost of labor, as a common standard. But, while it has been seen that the lowest estimate of the Board, on the western section of the canal, near Pittsburg, is at seven cents the cubic yard, augmented at the rate of 6.8 per cubic yard for every forty yards of additional transportation; and that the lowest estimate on the eastern section is 14 cents, subject to like augmentation; the contract prices of the excavation of the eastern section of the new Pennsylvania Canal, following the margin of the Susquehanna, are, for the lightest excavation of earth of all kinds, 7½ cents the cubic yard, and, for the most heavy, but 12½ cents; for that of slate-work, from 25 to 30 cents; of other rock, from 35 to 70. The last price being charged in but a single section out of twenty-five consecutive sections; while, in all, the removal of the excavated material out of the line of the canal, constitutes part of the charge of the excavation itself, and is included in the contract price. From this fact, apparent in the table of prices, transcribed from the Commissioners' office in Harrisburg, rock excavation is expected to occur in twenty-two of these sections, and, therefore, it is improbable that on those the plough and scraper could be applied to facilitate it.† In the estimate of the Board, the sum of \$280,000 is allowed for excavation below Cumberland, at a cost for each cubic yard exceeding 60 cents; and more than \$193,000 of that sum, is for excavation; exceeding, in cost, one dollar the cubic yard. The excavation alone, of the 186 miles of the eastern section of the Chesapeake and Ohio Canal, is computed by the Board, at more than two millions and a half of dollars, the price at which Messrs. Lacock and Shriver offered to contract an entire canal of somewhat less dimensions; requiring, how-

* One horse working on a level plane, between two posts, by a rope fastened at each extremity to the body of the wheelbarrow, and passing over a pulley, or through a block at each post, drawing the wheelbarrow alternately from the bottom of the Canal.

† The dimensions of this Canal, between Swetara and Harrisburg, extend to the breadth of fifty feet, and depth of six feet; the greatest depth of the tide known in a Canal in America; the locks are required to be 95 feet long by 18 feet in width. The contract price of this canal from Swetara to the Juniata, does not exceed, on an average, \$10,000 the mile. (See a late essay of William Hollins, of Baltimore.)

ever, each expense, except that of excavation, to be very near the same : For the enlargement of the breadth of a canal involves, in a very inconsiderable degree, as the Board have shown, (see the remarks of the Board on the last reported subdivision,) any other additional cost than of excavation, and, *under some circumstances*, where the canal passes along the face of a mountain, and much earth is required to embank and fill in at bottom, it is as easy, if not more so, to make a broad and deep canal than a shallow one.

The over estimate of labor, in the analysis of the Board, proportionably swells the charge for embankment, as has been already intimated. This is often nothing more than a particular application of the excavated earth and stone, after it is gathered upon the scraper, wheelbarrow, or cart.

It is, therefore, very difficult to separate the cost of *embankment* and *excavation*, till the line of a canal is precisely determined, the ground to be excavated, marked out for contract, and the foundations for the embankments designated. A reference to the report of the Board, (see the second paragraph of the report,) as well as to a prior correspondence between the chief of the Engineer Department and the Central Committee, shows that this has not been yet done, in relation to the Chesapeake and Ohio Canal. It may, therefore, be found, hereafter, and prior to the commencement of the canal, that the cost of excavation supplies the place of that embankment, as was so frequently realized on the New York Canal, as to give enormous profits to those contractors who could avail themselves of this advantage.*

For this, as well as many other reasons, it is now universally admitted, that the Canals of New York, about to be constructed, could be made at twenty-five or even thirty per cent. less than their actual cost. And it is for this reason that the Committee have not sought to derive, from the experience of that State, any part of the basis of their estimates.

That of Pennsylvania will be seen, embodied in the table of a civil Engineer, at present in her service, and possessing her confidence.

A few months' practice is sufficient to acquire the little skill required for constructing dry walls without arches or openings ; walls of great thickness, and requiring, generally, if not universally, but one smooth face, the cost of mere labor in the estimate of hauling, as well as paving, an operation yet more simple, would furnish a tolerably safe measure of value. But, inasmuch as transportation, or peculiar difficulties in quarrying stone, may be expected to augment the quantum of labor, it may not be improper to submit a few general remarks, applicable especially to the eastern section of the Canal, on the known facilities attending both these operations along the Potomac.

The great abundance of excellent building stone, from the granite cliffs on the tide, to the various species of sandstone at Seneca, and above it, and of limestone and marble still higher up this river, constitutes one of the most striking features of the bordering country.

* This fact is derived from the concurrent statement of several Representatives of that State.

The admirable quality of some of the species of this stone is manifested in the steps of the eastern front and the pavement of the Rotundo and Portico of the Capitol.

There is *no point on this river* to which freestone, granite, or limestone, could not be *float*ed down the stream at very little cost, where required, of a quality peculiarly adapted to the construction of locks or aqueducts. But stone, calculated for *walling* and *paving*, is almost every where to be found, and exists no where in such abundance as where most needed, in the projecting cliffs of those hills and mountains whose ranges are penetrated, or bases are occasionally washed by the river.

It is in such situations, chiefly, that walls of massy strength are required, to resist a rapid current, swelled by freshets, threatening an abrasure of the banks or of the lining of the canal, and of such height as to keep out the river at its greatest rise. Much of the stone used for these purposes will be excavated from the canal: enough, in cases where the greatest consumption is required, will probably be obtained by heavy blasting on the overhanging or steep declivities, below which a base is to be formed in the river itself, for the bed and towing path of the canal.

Transportation, therefore, will rarely enter into the price of walling, or paving, or indeed of masonry, except where stone is needed of a particular quality for locks or aqueducts: and here it may always be effected, down stream, to points opposite and near to the works for which it is designed, at least throughout the entire eastern section of the canal.

It is on 186 miles of this section, however, that the walling is computed at \$2,737,808 68 cents, being about \$88,000 the mile, of running measure, though the wall no where exceeds twenty-four feet in height, and is almost exclusively dry, or supposed to be constructed without mortar. The analysis of this estimate, allowing for walls erected of stone found on the spot, to the extent of 829,979 cubic yards, the sum of three dollars the cubic yard, or \$2,489,937 in the total, is therefore the more extraordinary. In the contract just executed for the portion of the James River Canal, extending along the Balcony Falls and the base of the Blue Ridge, in the counties of Amherst and Rockbridge, in Virginia, where six and a quarter miles of wall have been required on a line of but seven miles of canal, and this wall, seldom less than 15 feet, sometimes extends to 33 in height, \$1 25 has been the price given in contracts which have been already, as regards the contractors, some, if not all, gentlemen of the highest moral worth, honorably, but very profitably executed. An application of this rate of reduction, would bring down this sum to much less than one moiety of the cost, at which it is charged, upon the eastern section of the canal.

An analysis of the price of dry walling in the country adjacent to the canal, would furnish the following results: for walls of stone not squared, having its sharp angles hammered off, but not faced with rectangular surfaces, for quarrying, from 25 to 50 cents the cubic yard;

for hauling any distance not exceeding a mile, from 6 $\frac{1}{2}$ to 62 $\frac{1}{2}$ cents; for laying, after roughly dressing, from 25 to 50 cents;* for laying, where the stone was already excavated and lying on the side of the ridge, so as to dispense with hauling or removal, but for laying in the wall, the cost, by the cubic yard, would not exceed 50 cents; the mere laying in the wall, as it appears, actually costs but 40 cents on the Pennsylvania canals.

A table, prepared by a member of the Committee, computes the saving in the whole line of the canal, in this item, very near three millions of dollars, assuming the quantities of the Board, and their description of the quality of the wall, to be correct.

In the article of paving, to which almost any stone that will withstand the frost is applicable, it is believed that a proportionable reduction might be effected. By the gentleman referred to in the last note, this item is computed at less than a moiety of the sum charged by the Board.

Although in *masonry* there is much skill required in determining the curvature of arches, and adjusting the pattern of each stone by reference to its peculiar place in the arch, yet, in quarrying the stone, and preparing the cement of the wall or arch, according to the prescribed proportions of the materials of lime and sand which enter into its composition, ordinary labor is also the measure of value. Even in cutting the whole, or the far greater part of the stone, by the patterns provided by the artist, the necessary skill is easily and promptly acquired by the previously uninstructed laborer.

It is believed, therefore, that an analysis of the prices of masonry would lead to as great a reduction of the cost of that article, where it is of stone, as where the material is required to be hard burnt brick.

Before the committee leave the eastern section of the canal, it is incumbent on them to notice the subdivision of that section received from the Engineer Department since the recommitment of this report. By the charter of the Chesapeake and Ohio Canal Company, it is made an essential part of that section, and it still appears to be the only line of proposed canal that connects, without the intervention of any land carriage, the beds of mineral coal east of the Alleghany, with the town of Cumberland, to which this necessary article is now brought over land, not less, in any instance, than eight miles, at a cost for transportation merely, which exceeds what would be an ample compensation, for its carriage by a canal, from the mouth of Savage to the District of Columbia.

If, therefore, expediency shall hereafter recommend the more Northern route proposed by the Board for the continued canal across the mountains, still, for the benefit of the coal trade, it may be wise to extend a canal from Cumberland to the mouth of Savage. The dam and feeders required above Cumberland, for the canal below, will reduce, in part, by backing the river up in a basin of eight miles, the cost of such extension; and the vast supplies of lumber, iron, and

* This analysis has been submitted to a member of the House of Representatives who was a contractor for the New York Canal, and by him approved.

coal, which would be yielded by this subdivision, from the bordering mountains, would richly repay its cost. By bringing iron and coal, fit for coking and smelting, into the immediate vicinity of each other, and of constant still-water navigation, to the Atlantic, this branch, (should it be but one,) from the main canal, would multiply this essential material of all the arts, as it has been in England since 1778, by the same causes. It becomes the duty, therefore, of the Committee, to turn their attention to the estimates, by the Board, of the cost of this subdivision, in order to fulfil the object of their appointment.

The length of this subdivision is 30 miles and 350 yards; its descent, divided among thirty-nine locks, 312 feet.

The Board have computed its cost at \$1,794,903 86, of which the sum of \$720,665 80 is allowed for walling in quantities of 214,931 cubic yards, in distances, taken together, of but 8 miles and 1170 yards. The lowest excavation is charged at 17 cents the cubic yard; the total amount 1,036,618 cubic yards, at \$339,441 46. Of the embankment, 562,040.80 cubic yards are charged at the gross sum of \$113,257 60; the lowest estimate being 22 cents the cubic yard.

These charges, with \$492,000 for lockage, make up the entire summary, exclusive of \$62,277 for aqueducts; \$14,200 for culverts and bridges; \$51,722 for 265,980 cubic feet of puddling; \$18,200 for 18 miles of fencing; and \$1,000 for a waste gate and two waste weirs.

The far greater part of the walling, where stone eminently abounds, is charged at 4 dollars the cubic yard.

As the Board have distinctly reported that they found, on applying this calculation to the ground over which this subdivision will be conducted, "that a very trifling *decrease* of expense would be made by decreasing, *materially*, the dimensions of the canal," it cannot be presumed that the ground is here very unfavorable for that species of still-water navigation. And the Board still farther add, "that the unfavorable character of the river for a lock and dam navigation, which was thought of as a substitute," for the continuation of the canal, "would have rendered this scheme almost as expensive," and, as they most truly subjoin, "*much inferior in usefulness to the independent canal.*" (See the description of the subdivision between Cumberland and the mouth of Savage.)

If the same ratio of reduction be applied to this subdivision as to the eleven others, which make up the entire eastern section, its cost will not exceed, at the utmost, seven hundred and fifty thousand dollars; nor the entire eastern section of two hundred and sixteen miles, between Georgetown and Savage, four millions of dollars, though estimated by the Board at \$9,971,984 91 cents, or very near ten millions of dollars.

The arguments already adduced by the Committee, prove that the portion of that section of the canal beyond the western base of the Alleghany, could be constructed at one-third of the sum estimated by the Board: an argument founded on the actual cost of a similar canal along the Alleghany river, leading from a common point of both, up a

neighboring river, not more favorable for canal navigation than the Monongahela, does not furnish a more conclusive evidence of the enormous character of the estimates of the Board, than may be adduced, under the immediate eye of the Convention, from a comparison between the cost of the $2\frac{1}{2}$ miles of the eastern section, next to Georgetown, according to the estimate of the Board, and the cost of the same subdivision, according to the calculation of an experienced Civil Engineer, whose letter, stating the result of his examination of the ground, is subjoined.

He has, it will be seen, assured the Committee, with undoubting confidence, that one mile of this canal, next to Georgetown, having the dimensions required by the Board, where the ground is very rocky, precipitous, and uneven, could be constructed for 24,000 dollars, and the mile next below the locks and above the last, for 10,000 : the distance being actually two and a half miles, and the uneven ground extending almost half way ; this would make the cost of conducting the Canal to Georgetown, from the present locks, on the level of the present canal, or 37 feet above the tide, 42,500 dollars, exclusive of any lockage. The United States' Board of Internal Improvement have, however, estimated the same work precisely at a sum exceeding 140,000 dollars, exclusive also of lockage, and of any allowance for the basin at Georgetown, which is separately computed at 10,842 dollars. (See the 11th subdivision of the report.)

Before the Committee enter upon the examination of the computed cost of the tunnel. in the estimate of the Board, they will premise, first, that water lime, not known to the public, nor to the Board, to exist near the line of the canal, when that estimate was made, is now procured at Pittsburg. from Beaver Creek. in Ohio, in great abundance, and of excellent quality, at 18 cents the bushel. It has, indeed, been found on the New York, the Pennsylvania, and the Ohio Canals. and it is believed that a discovery of it has never yet failed to be made on every long line of canal in the United States. But if required to be imported from an Atlantic city, for any part of the eastern section of the canal, it may be had in Philadelphia, of superior quality, for from 25 to 35 cents the bushel. The effect of this reduction of the price of this species of cement, on the cost of the tunnel, will be very considerable ; according to the estimate of the Board, near 200,000 dollars ; and this is exclusive of the reduction, by more than one-half of the cost of labor on this expensive work.

The charges of several other items of expense, indeed, are alike susceptible of great diminution.

—The cost, for example. of the steam engines to be used in the working shafts descending along the side of the tunnel, furnishes another evidence of the defective sources on which the Board must have relied for their evidence of the cost of the work which they have estimated. By reference to the letter marked No. 17, in the Appendix to this Report, the Convention will perceive, that a steam engine, of ten horse power, can be purchased at Pittsburg, for one thousand dollars, while the Board have computed the price of one of the same power, at five times that sum. In this preparatory article of expense, taken singly,

a saving will be effected of not less than \$ 40,000 ; and the engines, it may be observed, will not be without their value when the work shall have been completed for which they are transported to the tunnel.

But it is, as has been noticed, on the price allowed for the bricks of the entire lining of the tunnel, that the greatest excess has been here committed. The Board admit that suitable clay can be had, and the bricks made, within 800 yards of the shafts, down which they are to be let into the tunnel. As the arching and excavation, where the former is at all necessary, must proceed contemporaneously, the buckets that take up the loosened earth and stone, will descend, when required, with the bricks. As the shafts are so multiplied as to be, throughout, within 180 yards of each other, throughout the tunnel, the length of the transportation within, it will, in no case, exceed 90 yards. One dollar and twenty-seven cents, however, is allowed per 1000 for transporting the bricks to the place where they are required for use. But what is much more worthy of remark, while the dimensions of each brick is reduced below the ordinary size thirty-seven and a quarter per cent. as much as five dollars per 1000 is allowed for their cost at the kiln. (See Report, page 32.) The Board seemed not to have considered that the proportion of hard bricks which a kiln of 100,000 will yield, when well burnt, where each brick contains $101\frac{1}{4}$ cubic inches of clay, cannot be a just measure of the number of hard bricks a kiln would yield, having in it the same number of bricks, each containing 64 cubic inches only, or being of the reduced size required by the Board. The Committee are assured that the proportions of hard burnt bricks yielded by a kiln of a given number, will vary with the quality of the clay ; the size of the bricks ; the quantity of fuel allowed, and the skill with which they are burnt, itself the result of experience. Coal will be found, in great abundance, immediately to the west of the tunnel ; wood, every where above it ; and by burning each kiln, after the first, at any yard, in a permanent case, the number of bricks unfit for use in the tunnel, will be, after a very little experience, found to be very few, much less than 40 in every hundred, the number rejected by the Board.

In proceeding in their examination of the cost of the proposed tunnel, the Committee are aware, that, in the United States at least, they can procure few facts to guide them. Even in Europe no tunnel, it is believed, has been constructed, having an incumbent mass of earth above it, exceeding, in any part of its course, eight hundred and fifty feet, although tunnels are as old, in Italy, as the reign of the Cæsars ; and there are tunnels in France of modern construction, as long, and in England very nearly as long, as that described by the Board. The Engineer from whom many of the facts in this report have been obtained, is now superintending the excavation of a tunnel near Lebanon, in Pennsylvania ; the cost of which, he reports, is fifty dollars the running yard ; its dimensions 17 feet wide, and its height the same. Twelve men can work upon it at a time, and a single cart suffices to clear away the excavated materials. Peculiar difficulties, he reports to have been met in the excavation, from the mass to be pene-

trated being hard slate in lamina, having an unfavorable dip, and here and there interspersed with veins of siliceous, which, when encountered, turns the edge of the augers used in boring. A mile of such tunnel would cost \$88,000. The Committee are not informed whether this sum includes arching were necessary. That the labor to be wrought within a tunnel, where safety from personal danger is assured, will not be unpleasant, or more expensive, the Committee are inclined to believe, for the reason already stated. Its operations will not be affected by intense heat or cold, or by any changes of weather. They may be, therefore, unintermitted, and a double set of hands employed to hasten their completion, by night and day.

But may not some part of that labor be saved? The cost of excavation is computed as if the excavated mountain were sand stone rock. (See the Report of the Board.) Will it be necessary every where throughout the tunnel, to line its arches at top and bottom, as well as its sides, with brick? The Committee are not aware, that it is at all probable, that the bottom of such a tunnel would require lining, or that arches through sand-stone rock, which the Board assumed to be the average quality of the mass to be penetrated, may not be found to dispense altogether with the artificial lining with brick. It would seem to be very unreasonable to charge the entire excavation, as of such rock, and yet to provide a lining of brick throughout the entire tunnel of four miles. For ventilation merely, it has been ingeniously suggested, that boring with a six inch auger from the surface of the mountain to the summit of the tunnel, and tubing down, as is practised in the numerous Western salt works, with augers of smaller size, would amply suffice. Half the shafts might, therefore, be dispensed with, especially towards the interior of the tunnel, since the Committee are also apprized, that one mile of horizontal carriage, on a wooden railway or track, with carts and horses, is not more than equivalent in cost to a perpendicular lift of 400 feet.

Should the masonry prove indispensable, the Committee believe it may be confidently computed at one-half the cost assumed by the Board, and that every other item will admit of the like reduction; since the article of labor, which affects so sensibly that of excavation, as well as every other, is rated at \$1 12½ the day. The Committee, therefore, believe, that the tunnel can be constructed at less than one half of \$2,495,242 80, the computation of the Board, in which \$1,892,000 is allowed for the masonry, and \$473,124, being a dollar the cubic yard, for the mere excavation of the tunnel. Should its cost be computed at \$1,250,000, then the Committee are assured, that its enlargement to a breadth sufficient to permit two canal boats to pass each other with ease, would not add more than one-third to that expense. So that an enlarged tunnel, obviating every impediment to the ready passage of boats, may be computed at less than \$1,700,000. This sum, the Committee believe, greatly exceeds the cost of any similar work in modern Europe, or America, making every allowance for difference of dimensions and improved construction.

If the part of the western section of the canal, including the reser-

voirs, be completed before the tunnel is commenced, water carriage of all the necessary materials, of coal, iron, lime, and provisions, to the entrance of the tunnel itself, may be substituted for land carriage, and made to contribute to a reduction of its cost.

In this sentiment the Committee concur with the Board, that a precise and exact estimate cannot be made of the cost of the Chesapeake and Ohio Canal, until it is traced on the surface of the ground, for actual excavation. (See the 22d page of the Report.)

But the Committee trust they will be warranted, by the facts and deductions which they have now presented to the Convention, in stating it to be their confident opinion that the entire Canal cannot exceed, in actual cost, ten millions of dollars, even after it shall be extended, as the Board proposes, to the entrance of Georgetown; after, by its various feeders, and its descending branches, and locks, down to the navigable rivers, along whose margins it will be conducted, it shall have equalized the value of its channel, to the opposite shores; and after it shall be extended in breadth, wherever practicable, to promote a diminution of the resistance of the water to the minimum of an indefinite expanse, or to sixty feet; a breadth which it should, at any rate, possess, between the last resort to the Potomac, above the Little Falls, and Georgetown; in order that, for all future uses authorized by the charter, there may exist an ample supply of water, without injury to the navigation of the main canal. This calculation the Committee venture to indulge, on the supposition that no great and unforeseen change shall occur in the circumstances of the United States materially affecting the price of subsistence, and consequently the wages of labor.

Even in any such event, unexpected and improbable as it now appears, it should be remarked that the former has never been suddenly and greatly augmented in the country through which a great part of the canal will extend; and that, hitherto, all the experience of the United States demonstrates that the cost of labor, in canalling, has been continually declining, except where peculiar circumstances have co-operated to raise its price. The same contractors who constructed certain parts of the New York Canals, the popularity of which, in the country through which they passed was sustained in part, it has been intimated, by extraordinary allowances for every species of work, are now the contractors for portions of the Ohio Canals, and, having finished or partly executed these, have engaged in the structure of those very canals of Pennsylvania to which the Committee have appealed in justification of their estimates.

In answer to the suggestion, countenanced in some degree by the Board, (see page 23 of the Report.) that an increase of the price of materials and labor may be expected on the commencement of the canal, the committee maintain a position which they believe to be universal in its application, and incontrovertible; that, where the supply of every commodity is unlimited in extent, and there is an abundant capital to bring it forth in the market, an increase of demand for its use will always occasion a reduction of its price. They extend this principle to the cost of lime, bricks, and even labor, which last, in a popu-

lation of twelve millions of people, who maintain an army on land of but six thousand men, and a few armed ships at sea, may be regarded as unlimited for every purpose of canalling or internal improvement. But this charge is, moreover, liable to be restrained from great and sudden augmentation, by a consideration peculiar to the greater part of a line of this canal: that its works are to be constructed, where, in any emergency, involuntary servitude might be called to their aid. The bare possibility of this would prevent exorbitant demands for an increase of wages, or sudden combinations to raise the price of labor. Experience confirms the principle on which the Committee here found their reasoning. The advantage to be derived from the vicinity of the line of the Canal to Pennsylvania and Ohio, and to abundant supplies of skill and labor, should not here be overlooked.

In this great work no part of its actual cost need be swelled by an allowance of large "profits of stock." It is a part of the merit of the plan of its execution, that, blending private with public interest, it not only may, but probably will, be let out for construction in small portions to contractors, supervised by experienced Civil Engineers. No favoritism will award the contracts; ample security will be exacted for their punctual fulfilment; and all special indulgences will be excluded in enforcing their faithful performance.

The contractors themselves, in the first instance, will supply, by established character and credit, the little capital required by each; and they will work, not in the spirit of speculation, for large profits, but for small gains, such as have been realized by contented and laborious industry in the recent works of Ohio and Pennsylvania. Such gains bear but a small proportion to what those, who adventure in extensive and hazardous speculations, usually allow to their subordinate agents or overseers, or a Government dispenses in annual salaries to its officers of the lowest grade.

Skill in canalling, as in all other branches of experimental knowledge, is daily advancing. Every year new inventions, supersede, in part, or greatly facilitate, the operations of manual labor, and calculations, such as the committee have themselves founded on bona fide contracts, of recent date, or in transitu, will be regarded, hereafter, as alike extravagant with those which they have reviewed.

The following minutes of the cost of the Hudson and Delaware Canal, were derived from the contracts for its execution, in the office of Mr. Bolton, of the city of New York, the President of the Company:

"Breadth of the canal 32 feet at top, 20 feet at bottom, depth 4 feet.

"The date of the contracts is the 6th of December, 1825; the time limited for their execution, July 1st. 1827.

"On two rocky sections, 121 and 122. The embankment below the lock, on section 121, which shall be made from rock excavation, shall be counted as embankment, and not as excavation.

“ For excavation, 10 cents ; for embankment made from loose rock, or materials above the lock, 13 cents per cubic yard ; and for embankment, made from rock and other materials, below the lock, 45 cents ; for slope wall, made from stone and rock, below the lock, 75 cents ; and for slope made above the lock, and not blasted, 30 cents per cubic yard. But, it is expressly understood, that these prices are to include all necessary blasting of rocks to form the body of the canal. In general, the price of excavation varies between $7\frac{1}{2}$ and 10 cents the cubic yard ; embankment, from 5 to $12\frac{1}{2}$ cents. All earth necessarily excavated under or between the banks, shall be estimated as excavation ; and, in all cases, where the earth necessarily excavated, is not to be removed more than one hundred feet, to form the adjoining bank, or banks, no estimate for embankment shall be made.

“ For all turnpike bridges, or bridges to accommodate great travelled roads, as they shall be designated by the Engineers, 155 dollars each. For all farm bridges erected by the contractors, 85 dollars.

“ The above price is to include excavation for the foundation of the abutments, so far as is absolutely necessary. after the canal is excavated to its regular shape and form : the Engineer to be the judge of the materials and workmanship : and, whatever he shall decide and determine, in regard to the quality of materials and workmanship, shall be conclusive. And, should he determine that a bridge is badly constructed, and requires to be pulled down and rebuilt, it shall be done at the cost and charge of the contractor.

“ All turnpike bridges shall average 120 perches of stone masonry, and farm bridges, 60 perches. If more is required, it shall be paid for at the rate of $87\frac{1}{2}$ cents the perch. If less, it shall be deducted in the same ratio of price.

“ To be finished off in a crowning or curved manner, with a coping of large and well shaped stones. The wing walls shall be quarter circles, except in cases where the bridge crosses the canal diagonally, in which case, one wing may be reduced, and the other extended in such manner as may be required to support the bridge, embankment, or road-way. On the towing-path side, the radius of the face of the wing walls, 8 feet ; and the radius of banking, 12 feet. On the side opposite the towing-path, the radius of face, 12 feet, and the radius of backing, 16 feet.

“ Stone, of good quality, laid dry, and pointed with good mortar of quick lime, and sand in proper proportions.

“ *Culverts.*—Materials, form, dimensions, and mode of construction, to be according to the discretion of the Engineer. His estimate and decision to be final between the parties.

“ For all timber and plank furnished and laid in the foundations, and all plank for sheet piling, drove or placed down to secure foundations, and all plank, or guard sheeting, placed around and well united to the masonry of the walls, at the rate of \$ 10 per 1,000 feet, board measure.

“ For all stone masonry, laid up as required by contract, in the best quality of water cement, faithfully executed, for the construction

of abutments, wing walls, and heading, at the rate of \$2 75 per perch of $16\frac{1}{2}$ cubic feet. And for all arches of 3 feet span, and 9 inches deep, and, also, all arches of more than 3, and not exceeding 8 feet span, which are to be 1 foot deep, at the rate of \$3 50 per perch.

“Locks of stone, the sum of \$390 per foot lift.

“The walls to be 100 feet long, and to average 7 feet, including the buttresses, and 76 feet between the gates—the chamber to be 9 feet wide in the clear.

“To sustain a bank against a river striking it at right angles, and then running with it, 30 cents per cubic yard for a slope wall.

“Some half miles of the canal cost but \$1400; a single one, only, as much as \$9,847; and this, No. 521, combines difficulties of every form—a quicksand lying on shelving rocks, avalanches, and river freshes to guard against.”

The preceding minutes were found, after being mislaid, too late to be submitted to the Convention.

The tolls of the New York canals amounted in the last year to more than seven hundred and fifty thousand dollars: their cost has exceeded ten millions, including the interest on the capital borrowed to construct them. Subsequent experience, and the authority of the most intelligent Engineers, warrant the belief that they could now be constructed for two-thirds of their original cost. The excess of their tolls, so far beyond the most sanguine anticipations of their early patrons, will be manifested, by the subjoined extract from the memoir of Cadwallader D. Colden, Esq., published along with the narrative of the celebration of the completion of that great work.

“The Canals not having been completed when the Commissioners made their last report, there are not, now, documents before the public, which will show precisely what has been the cost of these works. There are, however, data, which will enable us to ascertain the amount very nearly. In the annual report of the Commissioners of the Canal Fund, made in 1825, they state, that all the moneys paid for the canals, up to the 1st of January of that year, after deducting the tolls received, amounted to 8,829,015 dollars: and, according to the last report of the Canal Commissioners, it then required, to complete the canals, and to satisfy all claims for damages, 800,000 dollars. These sums, added together, amount to 10,120,465 dollars, which may be taken as the whole amount which has been disbursed on account of the canals. The Erie Canal is 363 miles in length, and on the Champlain route there are 18 miles of canal. The extent of canalling, therefore, is 381 miles, which gives an average of 26,241 dollars a mile.”

“But there are connected with the Champlain canal. 46 miles of improved navigation in the Hudson and in Wood Creek. The expense of these improvements has been very great: so that in estimating the cost of the canals per mile, these 46 miles ought to be taken

into the calculation. This makes the whole length 427 miles, and the cost per mile 23,420 dollars."

"But it must be recollected, that when the question is, how much the canals have actually cost the State, they must have credit for the amount of the tolls they have yielded."

"The last mentioned report of the Canal Commissioners states, that, from the opening of the navigation, in the Spring of 1824, till it was closed by the Winter, late in December of the same year, although only 280 miles of the Erie Canal were navigable, and although the regions west of Buffalo had hardly began to pay their contributions to the Western Canal, amounted to 350,761 dollars. The Commissioners calculate that the tolls for the present year (1825) will amount to 500,000 dollars; and that, for the nine years succeeding January, 1826, they will increase, at an average of 75,000 dollars a year; and will, at the expiration of ten years, 'leave the State in the receipt of a clear, unincumbered revenue, from the Canal Fund, of more than a million and an half of dollars.'"

"The Commissioners say, that their calculations as to the receipt of tolls for the time to come, have been estimated so much within the probable proceeds, that they presume no contingency can take place, which will reduce the aggregate amount of the canal fund, at the end of ten years, below the sum specified. There is the more confidence due to their estimate, because it is certainly true, as they remark, that hitherto their anticipations, in reference to the receipt of tolls, have uniformly fallen short of the reality."

No. 16.

It will be seen, in classing the subjects which have yielded the largest portion of the tolls of the New York canals, that lumber constitutes one of the most productive. The transportation of salt will not be peculiar to the Erie Canal. It is found on the Youghiogany, near the line of the Chesapeake and Ohio Canal, and 570,000 bushels from the vicinity of the Alleghany river, were brought to Pittsburg in the last year, at a price, which, were the Chesapeake and Ohio Canal completed, would enable this necessary manufacture to compete successfully, in the markets of the Chesapeake, with foreign salt, and finally, to exclude the latter altogether from the entire country, opened along the canal and its lateral rivers, now navigable, above tide water, for five hundred miles into the interior.

The fisheries of the Potomac annually furnish, for foreign and domestic consumption, about 400,000 barrels of herrings and shad. Salt constitutes a large part of the value of this supply, about one bushel being allowed to each barrel of fish. The reduction of the price of salt, and the extension of the market for fish, which would result from the completion of the Chesapeake and Ohio Canal, would probably double this consumption in a few years. No apprehension need arise of the exhaustion of the natural stock of this article: for herrings are now used as manure near the shores of the Potomac.

No. 17.

It is on the supply of mineral coal that the Committee chiefly rely, in indulging confident expectation of very great profit on the stock of the Chesapeake and Ohio Canal Company. Sufficient space is not allowed, in a report already too far extended, to manifest all the grounds of this confidence. They are derived from a comparison of the well known quality of the Potomac coal, with that which is furnished by the other rivers of the United States; from the comparative facilities of reaching the elevated banks which supply it, by the canal boats; and from a consideration of the various and multiplied uses to which it is applicable.

If the District of Columbia, the States of Maryland and Virginia, the river Potomac, or the shores of the Chesapeake, shall, hereafter rear a city of but secondary rank, or all their cities together shall be equivalent to but one such emporium of arts and commerce; if this emporium shall not surpass the single city of Glasgow, in Scotland; the future profit accruing to the Chesapeake and Ohio Company from coal alone, will reach the *maximum* income, limited by its charter, as the following extract from a work of unquestioned authority will clearly demonstrate.

"In the suburbs of Glasgow, there are *eighteen collieries*, containing 58 engines, amounting in all to 1,411 horse power.

"Taking the average of three years, ending the 31st of December, 1824, *exclusive of what came from the suburbs*, 1,690,653 tons of coal were brought, annually, to Glasgow, by the Monkland Canal." The tonnage of this canal, at three cents toll a bushel for its coal, would amount to \$1,420,148 43, or near a million and a half of dollars.

On the 11th of April, 1825, there were in Glasgow 176 engines used in manufactures, amounting, in whole, to 2,970 horse power, average of engines 16 $\frac{27\frac{1}{2}}{1800}$ horse power.

"The first boat propelled by steam, in Europe, was made in Glasgow. It began to ply on the Clyde, in January, 1812. On the 11th of April, 1825, there were 53 steam boats plying on the Clyde, containing 68 engines, amounting to 1,936 horse power." Total steam power, viz: engines in Glasgow and on the river Clyde, 244, equivalent to the power of 4,906 horses.

"The population of Glasgow, in 1801, was 83,769; in 1821, 147,043. The population of the suburb parishes of Barony and Gorbals, are included in these estimates. The Royalty alone contained, in the last year, 72,765 souls."*

Throughout Great Britain coal is found, not on the sides of mountains, as along the Potomac, but beneath, and sometimes very far below the general surface of the country, as on James river in Virginia. It is, consequently, brought to the surface there, by the application of great power, and at heavy cost. Almost as much labor is exerted in

* Sinclair's Analysis of the Statistical Account of Scotland.

pumping water from the mine, and in raising the rock and earth loosened in excavation, as in elevating the coal to the surface of the earth; and the health of the laborers, immured in sulphurous and damp pits, while getting it, is exposed to a danger, which will not be encountered on the banks of the Potomac. Some estimate of this advantage of the Potomac coal mines, over coal pits, so circumstanced, may be formed, from the fact, that the bushel of coal now costs at the summit of the shafts sunk near the James river, considerably more than the computed expense of raising and transporting it to the markets of the Potomac, exclusive of toll. Every branch of American manufacture is destined, hereafter, to experience this advantage, in a competition with Great Britain, for the supply, not only of American consumption, but of that of all other nations. Great Britain owes her superiority, in manufactures, eminently, to her abundant mines of this valuable mineral, and that nation which shall hereafter obtain it, on the cheapest terms, all other circumstances being alike, must surpass her in the mechanic arts, as she has hitherto done the rest of the world.

Prices of Coal in Philadelphia, from 1818 to 1825, inclusive.

1818.	Foreign coal, Liverpool,	-	50 cents per bushel.
	Do. New Castle,	-	35
	Virginia,	-	31
	Pennsylvania,	-	50
1819.	The same, of the whole.		
1820.	The same, excepting Pennsylvania,	30	
1821.	Foreign coal,	-	50 a 35
	Virginia,	-	28 a 30
	Pennsylvania,	-	50 a 35
1822.	Do.	-	" "
	Foreign,	-	28 a 35
1823.	Do.	-	50 a 33
	Virginia,	-	25 a 28
	Pennsylvania,	-	25 a 30
1824.	Do.	-	23 a 35
	Virginia,	-	20 a 28
	Foreign,	-	30 a 33
1825.	The same as 1824.		

Owing to the season being far advanced when the Schuylkill navigation was completed, and the dryness of the season, there was less Pennsylvania coal brought to market than was expected. The price has of course risen since the beginning of Winter. The general expectation is, however, that there will be a plentiful supply next Summer and Fall, from the Lehigh and Schuylkill mines, and that the price will not exceed 20 cents per bushel, or \$5 60 per ton, of 28 bushels.

The preceding table and statement was supplied to the Central Committee of the Chesapeake and Ohio Canal, by a member of the Senate of Pennsylvania.

The price of coals on the James river, and the cost of Virginia and Pennsylvania coal for a series of years, in Washington, will be found in the annexed information from a resident merchant in Washington, and a dealer in that commodity.

“Estimate of the prices at which the Virginia Coal, brought from Richmond, has been sold, for the last five years past, or from 1821 to 1826.

“Price of Coal in Richmond, in 1821, from 14 to 20 cents per bushel of 4 pecks; depending entirely upon quality. The Coal on the south side of James river has generally been esteemed the best, and has generally commanded from 4 to 6 cents per bushel more than that on the north side.

“The same coals have generally been sold in this market at from 25 to 33 cents per bushel, agreeable to the standard measurement of this District, which is about 10 or 12 per cent. more than that in Richmond.

“Since my residence in this city, which has been for the last five years, there has been but little or no fluctuation in the above prices; and, if any, they have been gradually declining; owing, I think, in the main, to wood having been sold within the last few years cheaper than formerly, and in some measure to the Lehigh and Susquehannah stone coal having been introduced here within the last two years, which is preferred by some people. There has also been, within the last two years, from 10 to 12,000 bushels or more of the pit coal brought from Cumberland, on the Potomac, to this place, which, I think, in point of quality, superior to any pit coal I ever saw, and it has sold at from 28 to 30 cents per bushel by this measurement. The Lehigh and Susquehannah coal, which is a hard stone coal, sells for \$8 to \$9 per ton, equal to 28 bushels to the ton. The estimate generally made of the consumption of coal for a fire place for the Winter, is 50 bushels. I would myself consider 75 bushels not too much for the season in this climate, when fire would be at least agreeable, if not necessary.

“Washington City, 24th May, 1826.”

When the boats of the Chesapeake and Ohio Canal shall reach the coal banks on the Potomac, it is believed that coals can be put on board at one cent a bushel, which is more than the price now paid for loading the coal wagons at the banks, near Pittsburg.

From the enlarged dimensions of the Chesapeake and Ohio Canal, designed, as has been seen in a former note, to give to the boats the advantage of floating on an indefinite expanse of water, the freight cannot be computed at more than four, or, at most, five cents the bushel. The tolls charged on this commodity, in the early operations of the canal, will be required to be large, in order to yield a sufficient income upon the stock of the canal: they will, of course, be reduced, when the resources of the country through which the canal passes.

and the territories which it is designed to unite, shall be fully developed. If the toll for the first years be computed at 6½ cents the bushel, then the price of the commodity in the District of Columbia will be 12½ cents, exclusive of the mercantile profit of the dealer, which may make it fourteen cents.

On various parts of the line of the canal, it will be much lower. At Pittsburg, coal is delivered into the cellars of the houses of the inhabitants, after transportation from the neighboring mines, distant from one to five miles, at three cents the bushel.

The heat supplied by the Pittsburg coal, to that of wood, is deemed to be in the ratio of seventeen bushels to a cord of dry hickory. The specific gravity of the coal of Pittsburg is heavier than that of Liverpool. "In a manufactory at the former, 3000 spindles are moved during the day of 12 running hours, equivalent to 13½ hours, with 60 bushels of coal, which, at the same time, warms the houses and factories. By the arks, or rude boats, which descend the Ohio and never return, it is delivered at Louisville, after a voyage of 550 miles, accelerated by the freshes of the Spring and Autumn, for from six to eight cents the bushel."

The price of coal at the great manufacturing town of Manchester, in England, is 3½ pence sterling (equivalent to about 6½ cents, when reduced to American currency at par) the bushel, of six score, or 120 lbs. weight, which is equal to one and a half of Pennsylvania. The price of coal at Manchester is, therefore, near fifty per cent. higher than at Pittsburg. At Liverpool, it is still higher. At the coal banks upon the Potomac, it will be as cheap as at those near Pittsburg, where it is put in the wagon at less than a cent a bushel. Coal is now delivered at the manufactories of Zanesville, on the Muskingum, at 2½ cents the bushel. In a manufactory of window glass in that town, seventy thousand bushels are annually consumed at that cost.

New Jersey and New York are both looking to Pennsylvania for a supply of this mineral. The former expects to obtain it by a canal from the mouth of the Lehigh: the latter by the Hudson and Delaware Canal.

The following extract of a letter, dated Philadelphia, January 28, 1826, from a gentleman extensively engaged in the coal trade of Philadelphia, furnishes valuable information upon this subject:

"I have great pleasure in answering the queries submitted by you respecting the coal trade; my observations, you will observe, apply only to the mines at the head of the Schuylkill, and the improvements on that river; not having it in my power to give you information as to any other.

"The works are in extent about 108 miles, commencing at the Lancaster Schuylkill bridge, and ending at Mount Carbon, of which 62 miles are by canals, and 46 by pools in the river. The number of houses for lock keepers is 65, the number of locks below Reading 39, and above Reading 81, being, in the whole, 120; of which 28 are guard locks, overcoming a fall of 588 feet; deducting the 28 guard locks, leave 92, which give an average of about 6 feet 5 inches lift to each

lock; they are 17 feet by 75, and the time required in passing a loaded boat, is from 6 to 8 minutes.

"The cost of the coal on board the boats is a difficult question precisely to answer: the situation of the bed or vein, its thickness, the purity of it, whether intermixed with veins of slate and dirt, whether taken out by a drift or shaft, whether troubled with water, &c. &c., are matters that are to be taken into consideration. As far as my experience goes, I think that from two to four cents is the cost of raising it to the pit's mouth. No improvement whatever has yet been made in transporting it to the landing, the common two-horse wagons of the country, carrying about 30 bushels, are still in use: the present expense of hauling may be estimated at one cent per bushel per mile. Suppose then the coal to be raised at an average of three cents from a mine, two miles from the landing, it may be delivered on board the boats for five cents per bushel.

In consequence of the small number of boats on the canal during the last season, and the great demand for them, we were obliged to pay as high as seven cents per bushel, freight, from Mount Carbon. The toll is six cents, or \$1 68 per ton of 28 bushels. The cost of delivering it in Philadelphia, the last year, may, therefore, be estimated as follows:

At the pit's mouth,	-	-	-	3 cents per bushel.
Hauling two miles,	-	-	-	2
Freight,	-	-	-	7
Toll, -	-	-	-	6
Interest on cost of land and capital employed, salary to agent, &c. &c. at least,	-	-	-	2
				<hr/>
				20 cents.
				<hr/>

When the business is carried on by companies or individuals possessing large capitals, (which, no doubt, will be the case,) and with all the advantages of rail roads, steam engines for raising the water, wagons particularly calculated for the purpose, and other improvements in use in the collieries in England, it will of course be delivered at a much cheaper rate. It is supposed that, when the tow paths are complete, and those engaged in navigating the boats more experienced, that the freight will not be more than four cents; last season, in consequence of the tow paths not being finished, it required fourteen days for a boat to come down and return; hereafter it may be done in eight or nine. From present experience, flat bottom boats, carrying about 25 tons, or 700 bushels, 8 to 9 feet beam, 60 feet long, and drawing, when loaded, about 2 feet 6 inches, are preferred; two men, a boy, and a horse, are required to navigate them, and "it is a fact worthy of notice, that a horse towing a boat, will, with greater ease, go at the rate of four miles an hour in a pool, than three miles in a canal."

The veins of coal in Schuylkill county, with but few exceptions, dip nearly north and south, at an angle of forty-five, or thereabouts, and run about E. N. E. and W. S. W.; they vary in thickness, but generally are from four to six feet, many are found less, and some of ten and eleven feet thickness; if less than four, they are not considered profitable to work: a stratum of slate is always found above and below the coal. A few veins are found near the head of navigation, but the larger and more valuable lie at a distance of from one and-a-half to our miles.

Philadelphia, January 28th, 1826.

P. S. The price of coal last season, was \$7 33 per ton, until the month of December, when, owing to a short supply, it was sold as high as \$10 50."

The subjoined table "Of the Comparative Heights and Distances of the principal Districts of Anthracite Coal in Pennsylvania from market," is from the last report (of Dec. 1826,) of the Engineers of the Lehigh Coal and Navigation Company.

Several of the communications delineated below, are by a mixed navigation of canals and rivers, and some of them are exposed to the hazards of the Chesapeake Bay.

The Chesapeake and Ohio Canal, it is now ascertained, can be extended to Baltimore, so as to furnish a uniform line of canal navigation from the coal banks to that city.

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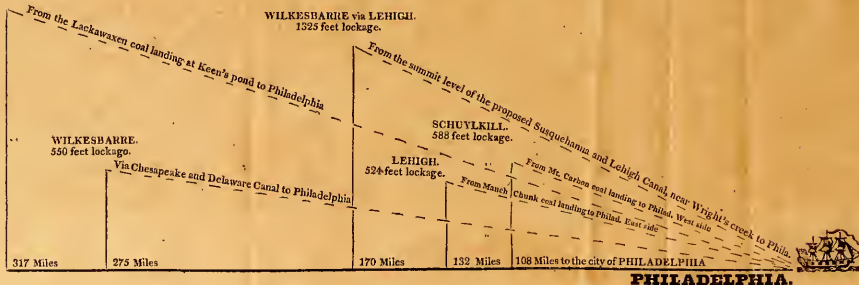
The Chesapeake and Ohio Canal, it is now ascertained, can be extended to Baltimore, so as to furnish a uniform line of canal navigation from the coal banks to that city.

DRAFTS

Of the Comparative Heights and Distances of the principal Districts of Anthracite Coal, in Pennsylvania, to Market.

LACKAWAXEN.
1583 feet lockage.

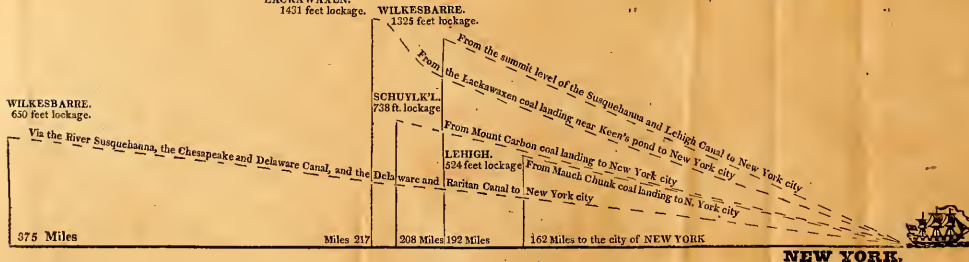
WILKESBARRE via LEHIGH.
1325 feet lockage.



LACKAWAXEN.
1431 feet lockage.

WILKESBARRE.
1325 feet lockage.

WILKESBARRE.
650 feet lockage.



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Sundry Canal reports suggest a commentary on the preceding table, illustrating the distances of the Northern coal mines from their nearest markets.

New York is known to rely, at present, for a supply of coal to her great emporium, on the mines of the Hudson; and the country on the margin of her canals, upon the Lackawaxen mines in Pennsylvania; while the Schuylkill and Delaware rivers and canals are expected to supply the wants of Philadelphia from Mount Carbon and Mauch Chunk.

The Legislature of New York has guarantied the credit of the Hudson and Delaware Canal Company to the extent of half a million of dollars, with a view to the first object. One hundred miles above the city of New York, and fifty miles below Albany, this canal leaves the Hudson, and passing through a part of New York and Jersey, along the Walkill, the Rendout, and the Never Sink, it enters the Delaware, sixty-seven miles from the Hudson, and seventeen miles below the mouth of the Lackawaxen. In reaching the Delaware, the canal overcomes a rise and fall of 634 feet. To extend this canal to the mouth of the Lackawaxen, a rise of 148 feet must be overcome in seventeen miles, and to conduct it along this stream to within four or five miles of the coal mines, near its source, will require another canal of thirty-six miles, overcoming a fall of 668 feet. The lockage to be overcome in the whole route is 1440, or by the report of Mr. Mills, 1431 feet, and the estimated distance from the Hudson to within four or five miles of the mines, 117 miles. Making, from the city of New York, a mixed navigation of 219 miles, and a land carriage of four miles. The canal, which is nearly completed as far as the Delaware, is but 32 feet wide and four feet deep, and its locks adapted to boats of five and twenty or thirty tons.

The following comparison between this line of navigation and that on which the Lehigh Company rely for the supply of coal to Philadelphia from Mauch Chunk, is from the pen of a Civil Engineer of Massachusetts, Mr. John L. Sullivan.

“The Lehigh Company appear to have an advantage in possessing both the navigation and the coal, but with the disadvantage of a descending navigation only, requiring a continual expense of arks; this, therefore, may be adduced as a reason why their coal cannot be afforded much, if any, lower. For you will find it stated in the New Jersey Canal Commissioners' Report, that coal at Easton, (the mouth of the Lehigh) will cost four dollars and sixty cents per ton, which they estimate, may, therefore, be delivered to the manufactories at six dollars and forty cents. But as Easton is ninety miles from Philadelphia by water, and 200 feet above the tide, this part of the navigation, which is double the length of the Lehigh, is to be added to that sum, together with the charges and profits at Philadelphia.”

The same Engineer, in a comparison between the advantages of the Hudson and Delaware Canal, for the supply of New York and those of the Schuylkill navigation, for the supply of Philadelphia with coal, says “the coal on the head waters of the Schuylkill is situated

nearly as far from Philadelphia as that of the Lackawaxen from the Hudson." The proprietors are, by law, entitled to a toll of nineteen cents per bushel, which is five dollars and thirty-two cents per ton. But it is not intended, at present, to exact more than eight cents per bushel, or two dollars and twenty-four cents per ton : "yet, it can scarcely be expected that the Navigation Company will not assess as much toll upon the principal article, as may be requisite to give a good interest on the investment, not being as a corporation, the owners of the coal, nor permitted to trade therein."

On a comparison of all these lines of internal navigation with that contemplated between Georgetown and the Coal Banks of the Potomac, the uniformity throughout of the navigation, upon a canal of very enlarged dimensions, and moderate lockage, added to the fact that the canal will enter the coal mines, must give a decided advantage to the Chesapeake and Ohio Canal.

No. 18.

When the forests of a country have been thinned or exhausted by the various uses to which wood is applicable, the cost of the manufacture of both lime and iron depends on the price of other fuel or mineral coal, if to be had at all.

Russia has been sometimes induced to prohibit or suspend the exportation of timber, for the sake of her iron manufacture, to the serious injury, and indeed almost total ruin, of a part of her subjects. Ireland, which early manufactured iron, at one time ceased to do so, because its forests would no longer supply necessary fuel. The quantity of iron annually supplied by the English mines, was, after the middle of the last century, reduced, from the same cause, to but 28,000 tons, when Dudley discovered that it could be smelted by the substitution of coked coal for common charcoal. In consequence of this discovery, the annual production of iron in Great Britain had risen in 1803, to 300,000 tons. Such will be the result in America, of pushing internal navigation from the Atlantic to the bases of those mountains that supply, in the same neighborhood, iron ore and mineral coal. The foreign importation of this necessary commodity will then cease, and an immense stock arise for exportation on terms cheaper than any other country now known can supply it to the world.

Pit coal, freed, by coking, from its bitumen, and made to resemble, as nearly as possible, the charcoal of wood, is consequently diminished in gravity. Coke is, therefore, transported in great quantity on the British canals, and is applied to various uses as well as to the smelting of iron ore, for which it is so extensively employed that it may be said to be the basis of the British iron works. The bitumen which is separated in a fluid form in this process of coking defrays its cost, and is applicable to many of the uses of vegetable tar. England, however, continues to import into New Castle and Hull large quan-

tities of Swedish iron for the manufacture of steel, and especially of that species which, being anciently used to make sheep shears, is called shear-steel, in her manufactures.

Iron has not been found in any considerable quantity on the Erie Canal of New York. It is manufactured in the high lands on the Hudson, and procured from Lake Champlain, of excellent quality, by the Northern Canal. It abounds, in every quality, on the Potomac, in the vicinity of the Coal Banks, and on the navigable streams of Virginia, which empty their waters into that river. The flux, essential to the manufacture of the crude ore, is abundantly supplied by lime stone and other minerals in the vicinity of the ore banks.

The mountains which seem to impede the progress of the Chesapeake and Ohio Canal, will, therefore, become the fruitful source of its income; which must surpass that of any canal which yields neither coal nor iron.

No. 19.

New York has regarded it as fortunate that she did not succeed, when she applied to the Congress of the United States to aid her in the construction of a work which bears such honorable testimony to her enterprise, and her resources. Uniting her two canals in one scheme of internal improvement, she conciliated towards them, though not without difficulty, the interests and feelings of a majority of her citizens.

The interests which sustain the Chesapeake and Ohio Canal, are divided between many States, and preponderate in the councils of none. Rivalships every where oppose the appropriations to this truly national work, and force it to look to the nation for aid.

But the application of New York, when urged with great ability by several of her most distinguished citizens, was not, in truth, rejected; and, had the continuance of peace permitted its renewal, it must ultimately have succeeded.

No. 20.

When the single fact presented by the coal trade of Glasgow is duly considered, for the amount of near seventeen hundred thousand tons is exclusive of the supply of eighteen collieries in the suburbs which do not use the Monkland canal, when added to this, it is considered that, through a single county remote from this city, that of Lancashire, in Great Britain, one million of tons is transported, there is nothing extravagant in this sentiment. The time will doubtless arrive in America, when iron rail roads will be required, not to supersede, but to aid canals, as in England, in transporting the produce of an empire, to which Great Britain bears a smaller proportion, than Europe to the habitable globe.

No. 21.

The Committee regard the subscription invited from the United States, as a loan of credit, rather than an appropriation of money to the extent of the sum subscribed.

If the canal be extended to the coal banks, in five years from its commencement, and the estimates of this report come only near their anticipated results, the stock of the canal will be then above par. In the interim, should a loan be effected at 5 per cent. to the extent of the United States' subscription, and, in the annual instalments proposed, of half a million each a year, the actual appropriation of the first year need be but the interest upon \$ 500,000.* or the sum of twenty-five thousand dollars; of the second, but twice, and, of the fifth year, of but five times that amount, being, for the highest sum of interest nearly, in amount, the annual appropriation for some years past to the completion of the public edifices in Washington, and this, on a supposition that no tolls are received before the entire completion of the eastern section of the canal.

No. 22.

The highest amount of the annual interest chargeable upon the two and a half millions which the Government is invited to subscribe, being at 5 per cent., \$ 125,000, if the total exports of the United States be increased but half a million of dollars, by the eastern section of the Chesapeake and Ohio Canal, and the average duty on the return cargoes of twenty-five per cent. be levied on a value but equivalent to the outward cargoes, according to the very narrowest view of this measure, the Government will not be a loser should it never realize the profit of a single dollar on its shares of subscribed stock. In cheapening the transit of timber to the Navy Yard, of fuel for all its uses, and those of the public edifices in Washington, to say nothing of the supply of water from the canal itself, for commodious docks, and other naval purposes, a profit not less than this might safely be added to those which it must derive from its character of a proprietor interested in this great work, exclusive of all regard for its character, the rights and obligations of a sovereign invested with both federal and local authority over the property and people of the District of Columbia.

A bill to amend and explain an act, entitled "An act confirming an act of the Legislature of Virginia, incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland, for the same purpose."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent already given by the United States to the charter of the Chesapeake and

* The present bill reduces this sum to \$ 200,000.

Ohio Canal Company, by an act of Congress, entitled An act confirming an act of the Legislature of Virginia, entitled an act incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland confirming the same, shall not be impaired by any change of the route of the said canal, from or above the town of Cumberland, on the river Potomac, or the distribution thereof into two or more sections, at any time hereafter, or any change in the dimensions of that part of the present eastern section, extending from Cumberland, or the mouth of Wills' creek, to the mouth of Savage, at the base of the Alleghany, or any substitution which the interest of the Chesapeake and Ohio Canal Company may, in the opinion of the company, require to be made, of inclined planes, rail ways, or an artificial for a continued canal, through the Alleghany mountain, in any route, which may be by the company finally adopted therefor between the town of Cumberland and the river Ohio.

SEC. 2. *And be it further enacted*, That, to obviate any possible ambiguity that might arise in the construction of the second section of the act of Congress aforesaid, by that act designed to be given to the States of Maryland and Virginia, or to any company incorporated by either or both of those States to extend a branch from the said Canal, or to prolong the same from the termination thereof by a continuous canal, within or through the District of Columbia, towards the territory of either of those States, shall be deemed and taken to be as full and complete, in all respects, as the authority granted by that act to the Chesapeake and Ohio Canal Company, to extend the main stem of the said Canal within the said District, or the authority reserved to the Government of the United States to provide for the extension thereof on either or both sides of the river Potomac, within the District of Columbia: *Provided*, That nothing herein contained shall impair the restriction in the charter of the Chesapeake and Ohio Canal Company, designed to protect the Canal from injury, by the prolongation thereof, or by any branch therefrom.

A bill authorizing a subscription to the stock of the Chesapeake and Ohio Canal Company.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Treasury be, and he is hereby, authorized and directed to subscribe, in the name and for the use of the United States, for ten thousand shares of the capital stock of the Chesapeake and Ohio Canal Company, and to pay for the same, at such times, and in such proportions, as shall be required of the stockholders generally, by the rules and regulations of the company, out of the dividends which may accrue to the United States upon their bank stock in the Bank of the United States: *Provided*, That not more than one-fifth part of the sum, so subscribed for the use of the United States, shall be demand-

ed in any one year after the organization of the said company: *And provided, moreover,* That, for the supply of water to such other canals as the State of Maryland, or Virginia, or the Congress of the United States may authorize to be constructed, in connexion with the Chesapeake and Ohio Canal, the section of the said canal leading from the head of the Little Falls of the Potomac river, to the proposed basin, next above Georgetown, in the District of Columbia, shall have the elevation, above the tide, of the river at the head of the said Falls, and shall preserve, throughout the whole section aforesaid, a breadth, at the surface of the water, of not less than sixty feet, and a depth, below the same, of not less than five feet, with a suitable breadth at bottom.

SEC. 2. *And be it further enacted,* That the said Secretary of the Treasury shall vote for the President and Directors of the said Company, according to such number of shares as the United States may, at any time, hold in the stock thereof, and shall receive, upon the said stock, the proportion of the tolls which shall, from time to time, be due to the United States for the shares aforesaid; and shall have and enjoy, in behalf of the United States, every other right of a stockholder in the said Company.

CANAL—BALTIMORE TO CONTEMPLATED CHESAPEAKE & OHIO CANAL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

Pursuant to a resolution of the House of Representatives of the 12th ultimo,

A REPORT AND PLANS

OF THE

SURVEY OF A ROUTE FOR A CANAL FROM THE CITY OF BALTIMORE

TO THE CONTEMPLATED

CHESAPEAKE AND OHIO CANAL.

JANUARY 14, 1828.

Referred to the Committee on Roads and Canals.

WASHINGTON :

PRINTED BY OALES & SEATON.

1828.

DEPARTMENT OF WAR,

January 11, 1828.

SIR: I have the honor to transmit, herewith, a report of the Chief Engineer of this date, accompanied by a report and plans of the survey of a route for a canal from the city of Baltimore to the contemplated Chesapeake and Ohio Canal, which were called for by a resolution of the House of Representatives, of the 12th ultimo.

As it has been found necessary to transmit the original drawings relative to this survey, I have to request that they may be returned to the Department whenever they may be found no longer useful to the House.

I have the honor to be,

Very respectfully,

Your obedient servant,

JAMES BARBOUR.

Hon. ANDREW STEVENSON,

Speaker of the House of Representatives.

ENGINEER DEPARTMENT,

Washington City, Jan. 11, 1828.

SIR: In pursuance of your orders, I have the honor to transmit, herewith, the report and plans of a survey of the route for a canal from the city of Baltimore to the contemplated Chesapeake and Ohio Canal, which were called for by a resolution of the House of Representatives, of the 12th ultimo.

As the accompanying drawings are original, I have to request that they may be returned to the Department, whenever they may be no longer serviceable to the House.

I have the honor to be,

Very respectfully,

Your obedient servant,

ALEX. MACOMB,

Maj. Gen. Chief Engineer.

Hon. JAMES BARBOUR,

Secretary of War.

REPORT on the survey of a Canal from the Potomac to Baltimore.

To Major General MACOMB,

Chief Engineer.

On the subject of the survey directed in your instructions of August 15, 1826, of the country from the Potomac to Baltimore, with a view to connect the contemplated Chesapeake and Ohio Canal with the harbor of Baltimore, I have the honor to submit the following report, and also to present, as elucidating the same,

Four maps, Nos. 1, 2, 3, and 4, exhibiting the line of canal, and the topography of the country in its neighborhood, and also the experimental lines.

Two sheets—profiles Nos. 1 and 2, containing the profiles of the line of canal.

Two sheets—profiles Nos. 3 and 4, of the experimental lines.

One book, containing the results of the field notes, the gauging of streams, &c.

The previous orders of the Engineer Department, and the instructions of the Board of Internal Improvement, both dated June 16, 1826, having authorized and directed me to make such investigations as were necessary to obtain satisfactory data with relation to several subjects, but particularly to the supplies of water which might be afforded to the contemplated work, Mr. F. Harrison, Jr. was engaged

as assistant ; who immediately entered on the duties assigned to him, and was assiduously employed therein during the two succeeding months. Among the objects to which his attention was directed, the most important was to gauge, repeatedly, during the season, the streams to which it was foreseen resort would be necessary. From the series of his observations, which were afterwards continued at intervals by the surveying party, it is believed that we have sufficient information to render entirely satisfactory the conclusions we have drawn on this subject.

The latter part of August was occupied in making the necessary preparations. I commenced operations in the field the first day of September, assisted by Messrs. J. F. Swift and F. Harrison, Jr. as levellers, and Messrs. J. Miller and J. Wall, as surveyors. These operations, involving a large number of experimental lines which were necessary to ascertain with certainty, as directed by my instructions, the most eligible route for a canal from Baltimore to reach the Chesapeake and Ohio canal, at whatever point it might be found most advantageous, and necessarily consuming much time, were not completed until the last of October.

The object to which my attention was first directed, was to acquire such a knowledge of the high ground intervening between Baltimore and the valley either of the Potomac, or some of its tributaries, as to determine where it might be passed to most advantage. The obstacles of this high ground consisted, within the extent of country in which there was a probability of attaining our object, of three ridges, which were necessarily to be crossed ; namely, 1. the ridge dividing the waters of the Patapsco from those of the Patuxent ; 2. the ridge separating the two branches of the Patuxent ; and, 3. the ridge dividing the waters of the Patuxent from those falling into the Potomac. It became clear that the proper course to pursue, was to establish the most favorable situation of the summit of the proposed canal ; leaving its continuation in either direction to be governed by this location of the summit. With this view, these three ridges were therefore carefully examined with instruments, as far as appeared necessary to remove any doubts as to the points we had selected being the best for crossing them. The following detail of these examinations will shew the grounds on which our conclusions are founded.

The ridge between the Patapsco and the north branch of Patuxent, is crossed by the Baltimore and Washington turnpike, at Waterloo, twelve miles from the first named city. Our examination of this ridge was begun at a bench-mark left at a depression $1\frac{1}{4}$ miles south east of Waterloo, on the Annapolis road, by the Maryland Commissioners in 1823, and, as determined by them, 200.29 feet above mid-tide in Patapsco ; a result which we found to agree with our observations. The point at which this bench-mark is made, was formerly selected as the most suitable point for passing the ridge, its depression being the greatest to be found, and a favorable valley making down from it towards the Patapsco, on the one hand, and another towards the north branch on the other. But to confirm the decision on this point, a lev-

elling and survey of the ridge was made for a considerable distance in either direction. To the northwest, it extended nearly three miles beyond Waterloo, where the further prosecution of this line was considered unnecessary, as the great height we had already attained evidently increased as we advanced, and our knowledge of the geography of the country plainly shewed, by the course of the streams, that the ridge must still continue to rise considerably for some distance beyond. To the southeast, the line was carried along the ridge until it reached a point opposite to which the waters on the left land, instead of flowing into the Patapsco, fell into the Severn. As it would necessarily add to the difficulties of the proposed work to be entangled in the valleys of this latter river, this circumstance was considered decisive on the subject to render any further examination of this line unnecessary. A reference to map No. 3, and profile No. 4, where this line is marked T U, and to the field-book, experimental line No. 10, will shew the details of its situation and elevation.

The dividing ridge between the waters of the Patuxent and those of the Potomac, required a more extensive examination. The survey made by the Maryland Commissioners, of which we had access to the field-books, was carried through the whole extent of Montgomery county, and showed clearly the inutility of making any further attempt in that quarter, above the granite ridge, running parallel to the sea-coast. We therefore confined our examinations of this first mentioned ridge to the southeast of the turnpike road, and extended our surveys four and a half miles, to a depression of the ridge, on the land of Zelic Duvall, and lying between the head waters of the Northeastern Branch and of Cash's Branch, a small stream falling into the Patuxent. This depression, and one close to the turnpike road, between the 20th and 21st mile-stones, offered, each, several advantages, which required some care to decide on the selection between them. The ridge at Duvall's may be passed at about fifteen or sixteen feet less elevation than at the other point; the ground is very favorable for cutting along the Northeastern Branch on the one side, and Cash's Branch on the other, and the general situation and direction of these valleys are favorable: but the following considerations induced the preference of the other route. Although the elevation of the summit to be cut through, is greater than at Duvall's, yet, from the very gradual declension of the ground on either side at the latter place, it is probable that the amount of excavation of the deep-cutting, would be nearly equal in both cases; while the route by Duvall's would involve the expense of a long feeder through unfavorable ground, and would also require extensive embankments across the broad valley of the Patuxent, more especially on the plan of having only one summit level for the canal; a plan which is so desirable, that it should not be abandoned but from the most serious considerations. The line marked N O, on map No. 2, and on profiles No. 3 and 4, and numbered 7 in the field-book, will shew the details of the survey of this ridge. It is necessary to observe that, for despatch, this line was carried along the most convenient ground, instead of keeping exactly on the crest of

the ridge, in situations where the obvious view of the topography of the country rendered such exactness unnecessary.

The ridge separating the branches of the Patuxent was found more formidable than had been anticipated; being found to differ but a few feet in general height from the two ridges before mentioned. The point we selected for passing it, is about a quarter of a mile to the southeast of the turnpike road, and was chosen for the following reasons: It lies nearly in a direct line between the two points fixed above, and is the lowest and most favorable depression that can be found within a considerable distance, offering greater facilities, and a less amount of excavation than any spot in the neighborhood. Another alternative offered of carrying the line of canal down towards the confluence of the two branches of Patuxent, until a favorable point offered for passing the intermediate ground. But while this plan would require a great deviation from the direct route, it would pass over ground rendered extremely unfavorable by the deep indentations of broad valleys, and composed of a soil unsuitable to retain water. So that this plan, while it would materially augment both the distance and the loss of water, would probably produce no economy of expense, and was therefore rejected. Reference to the map No. 3, and profile No. 4, where the line of survey of this ridge is marked R S, and to the field book, line No. 9, will show its details.

The investigations made of these ridges, may be considered as having satisfactorily shown, in the first place, that no line of canal communication from Baltimore to the Potomac can pass them to the northwest of the line selected. The general direction of this line is parallel to, and not far from, the foot of the granite ridge before mentioned, which traverses the Middle States, passing at the edge of Baltimore, and showing itself on the Potomac, at the Little Falls. The country to the west of this ridge, is, as it were, upheld by it, and is, therefore, considerably higher than that to the east of it; while the streams, in passing it, form falls of lesser or greater height, according as, from their size, they have been more or less able to break it down. It is this strongly marked geographical and geological formation, combined with the examinations I have made, that gives me confidence in pronouncing that all the communications which have been proposed through Montgomery county, such as those from different points of the Patapsco, or the Patuxent, to the head waters of the Seneca river, or the streams in its neighborhood, are entirely impracticable. On the other hand, the investigations I have made, authorize me in the belief that the line of canal selected, is more advantageous than any other that can be found to the south and east of it.

These points being determined, it became necessary, according to the instructions of the Board, to adopt such a level for the intermediate line of canal as would obviate, if possible, the necessity of alternate ascending and descending, and require only a single summit level. This, it was found, could be effected by passing the three ridges abovementioned at a considerable depth below their summits, either by tunnels or deep-cutting. Notwithstanding the formidable expense

of these works, this plan was adopted without hesitation, on account of the great advantages it offered. After several trials of the ground, by running lines at different levels, and much consideration, the elevation of 146 feet above mid-tide was adopted for the surface of the canal. This elevation is a few feet lower than would have been desirable, on account of the deep-cuttings and other circumstances of the ground, but was chosen in order to avoid injury to the extensive Savage Cotton Factory, situated on the north branch of Patuxent, the water of which branch will be required for the proposed work. As any injury to this factory would involve a great expense for damages, it was considered more advantageous to avoid it, by assuming a lower level than would otherwise have been expedient; which, although increasing the cost of the work, will, at the same time, render the plan of the canal itself more perfect, by diminishing the amount of lockage and the loss of water by filtration, to which the more extensive embankments necessary at a higher level, would be subject. This level will give to the canal a summit level of considerable extent, but will necessitate, on the supposition of passing the ridges without tunnelling, three extensive deep cuttings: 1st, of the Waterloo ridge, of the greatest depth, of 64 feet, and extending for the distance of $2\frac{1}{4}$ miles; 2d, of the middle ridge, between the two branches of Patuxent, of 74 feet greatest depth, and more than $1\frac{1}{2}$ miles in extent: and, 3d, of Snowden's ridge, near Vansville, of 72 feet greatest depth, and extending $2\frac{1}{2}$ miles. The expense of these cuttings will be truly formidable, as will be seen by a reference to the estimate, where the aggregate of the three amounts to more than one million two hundred thousand dollars. It was concluded, however, to assume this plan in making all the calculations; leaving it to future consideration to determine whether the greater economy of passing these difficulties, in part, by tunnels, would compensate for the inconveniences and embarrassments to an active trade which would result from their adoption.

This much being satisfactorily established, we proceeded to locate the summit level of the canal, which we found could be extended, with advantage, to $12\frac{1}{4}$ miles. A reference to the map will shew that it will be much less winding and circuitous, than, from the nature of the country over which it will pass, might have been anticipated. But little embankment will be required, and the ground, in general, except the obstacles of the deep-cuttings, is favorable.

The location of the summit thus established, we proceeded to the examination of the continuation of the canal towards the Potomac. The most natural course for this to pursue, was along the valley of the the northeastern branch, leading to Bladensburg. A line along this valley was accordingly surveyed, and found to be very favorable; at Bladensburg the line was crossed to the right bank of the Eastern Branch, and was continued on this bank to near the upper city bridge, whence it left the shore of the branch, and was carried through the city of Washington, to the north of the Capitol, the City Hall, and the President's House, to Rock Creek, over which an aqueduct is

proposed to communicate with the termination of the Chesapeake and Ohio Canal in Georgetown. From Bladensburg, several attempts were made to take advantage of several valleys, that appeared promising for the purpose, and to find through them a more direct and favorable line towards the Potomac, than that along the shore of the Eastern Branch. These attempts were, however, unsuccessful. Reference to the map No. 1, and profile No. —, where these lines are marked G H, I K, L M, and the field notes, Nos. 4, 5, and 6, will shew their situation and elevation. Through the city of Washington, the line was continued in a direction where a considerable amount of cutting must be encountered: this course was preferred, on account of its not interfering with any buildings, or other improvements of consequence; whereas a line that could be more easily executed, and that would be of more advantage to the city of Washington, might, without doubt, be found to the south of the President's House, and would amply compensate to the city, by its benefits, for the destruction of buildings which it would occasion. But as it could not be conveniently ascertained with correctness at the present time, how far this would be the case, it was deemed proper, in the first instance, to carry the line in such a direction as to avoid this interference with improved property as much as possible.

The execution of the canal, according to the plan thus proposed, depends essentially upon the supposition of the Chesapeake and Ohio Canal being continued from the Little Falls of Potomac to Georgetown, at an elevation of at least 25 or 30 feet above tide; and affording to this lateral canal, a supply of water sufficient for its consumption, at least as far as the Eastern Branch—a distance of about 5 miles. If, on the contrary, the principal canal terminated just below the Little Falls, or at some other point above Georgetown, the direct connexion of the Maryland canal with it becomes impracticable; and this latter work will, in consequence, be rendered imperfect, and deprived of half its utility. For it is believed that it may be confidently asserted, that, if the Maryland canal be forced to descend into tide at the Eastern Branch, and to have its connexion with the Chesapeake and Ohio Canal only through the tide of this Branch and the Potomac river, that it cannot attain its object of enabling the city of Baltimore to enter into a fair competition with the cities of the District, for the trade of the West.

The practicability of the line above described being established, the next object to which my attention was directed by my instructions, was to ascertain whether a more direct communication to the Potomac could not be found, to intersect the Chesapeake and Ohio Canal somewhere between Georgetown and the Great Falls. On a careful view of the ground, it was apparent that the principal obstacle to such a communication, was offered by the ridge separating the Potomac from Rock Creek. This ridge was therefore surveyed for about 5 miles above Georgetown, and was carefully examined as far as Montgomery Court-House. The result shewed it to be so unfavorable to our purpose, as to produce a decided conviction that

any canal from the Potomac, in the direction of Baltimore, and passing to the north of Georgetown, is absolutely impracticable. This ridge thus offering an insurmountable obstacle, rendered any further investigations on this subject unnecessary. A reference to the map No. 1, and profile No. 3, where this line is marked C D, and to the field book No. 2, will shew the particulars of this survey.

Having thus completed the surveys from the summit to the Potomac, we returned to the northern termination of the summit level, and proceeded with the survey of the line of canal towards Baltimore. This was continued along the valleys of Licking run and Deep run, to Elkridge Landing, where it crossed the Patapsco, and continues, along its left bank, to the Ferry Branch, in which our survey terminated at Carroll's Point. This was considered as a favorable place for the termination of the canal, as it is far within the limits of the city, close to its populous part, and upon a secure harbor, between which and the principal harbor or basin, a direct communication through the city may easily be made, whenever it may be deemed necessary.

Having thus given the details of the operation performed to determine the best line for the proposed canal, I now proceed to give a more particular description of the route selected. To do this clearly, it will be necessary to enter into some repetitions, which will be excused for the sake of perspicuity.

Supposing the Chesapeake and Ohio Canal to terminate, as proposed, in a basin in Georgetown, between Bridge and Water streets, the Maryland Canal will commence at this basin, and will continue, at the same level, to pass Rock creek, by an aqueduct, a little above the present upper bridge, and continue, nearly east, across the city of Washington, to the toll-gate at the boundary of the city, on the Maryland Avenue. From this point, the line follows the direction of a valley to the bank of the Eastern Branch, where it is proposed to descend by two locks, so as to place the surface of the water of the canal at the height of about 16 feet above tide. This is done to lessen the expense of the embankments which are necessary at several places along the shore of the Eastern Branch, and at the crossing at Bladensburg; but it will become a matter of future examination, whether a higher level than this cannot be assumed for this portion, with advantage. The line then continues along the bank of the Eastern Branch, and crosses it by an aqueduct immediately below the bridge at Bladensburg. Passing through this town, it follows, first, the valley of the Northeastern Branch, and then that of Piney Branch, crossing the turnpike road $\frac{1}{4}$ mile south of Vansville. A little beyond this, the line attains its highest elevation, and the summit level commences; and a little further the deep-cutting through the Snowden Ridge begins. The turnpike road will again cross the canal at nearly the deepest part of this cutting. From the northern end of this deep cut, the line passes over the main Patuxent, which it crosses by an aqueduct about 150 yards below the turnpike bridge, and continues nearly parallel to the turnpike road until it has passed the deep cut of the middle ridge. Here it deviates considerably from a direct course, passing the north branch

of Patuxent near the old Baltimore and Washington road, and then running nearly east, until it reaches the valley of Chandler's Branch, which valley it pursues to the commencement of the deep cut of the Waterloo ridge. This last cut extends to the valley of Licking Run, and not far from its end is the termination of the summit level. The line then follows this valley, and that of Deep Run, to Elkridge Landing, where it crosses the Patapsco by an aqueduct about $\frac{1}{4}$ mile below Smith's bridge. It then continues along the left shore of the Patapsco to about a mile below Sweetzer's bridge, where it crosses over the neck of land intervening between the Patapsco and the Ferry Branch, and which forms the isthmus of Moale's Point. It has been thought preferable to encounter the deep-cutting which this course will require, near Krieb's House, to continuing along the shore round the point, on account of the distance saved, and the extremely unfavorable nature of the shore to the north and west of the point. Arrived at the Ferry Branch, it continues along its west shore, and passes the outlet of Gwynn's Falls by an aqueduct and embankment, about 100 yards from the present bridge, and communicates, by two locks, with the tide at Carroll's Point. Here we supposed the canal to terminate; but if a continuation of it be deemed necessary, it may be made, without much difficulty, to enter the basin near its southwest corner, and near the intersection of Light street wharf with Hughes' quay.

The following summary presents, at one view, several of the particulars of this route :

SUMMARY.

	Distance, Miles.	No. of Locks.	Ascent, feet.	Descent, feet.
Georgetown to Bladensburg - - -	9 $\frac{1}{8}$	2	-	18
Bladensburg to summit level - - -	9 $\frac{1}{2}$	17	130	
Summit level - - - - -	12 $\frac{7}{8}$			
Summit level to Elkridge Landing - - -	5 $\frac{3}{8}$	16	-	122
Elkridge Landing to Baltimore - - -	7 $\frac{7}{8}$	3	-	24
Total - - - - -	44 $\frac{1}{2}$	38	130	164

On the supply of water.

The summit of the canal will be supplied with water, in addition to several small streams, by the two branches of the Patuxent, which can be conducted into it by feeders of $\frac{2}{3}$ and $1\frac{2}{3}$ miles respectively. In descending towards the Potomac, the water of the Northeastern Branch will furnish an additional quantity; and, near Bladensburg, the northeastern and northwestern branches will be both at command. It is proposed to supply the section from Georgetown to the Eastern Branch, a distance of about five miles, with water drawn from the Potomac, above the Little Falls, through the Chesapeake and Ohio canal.

In descending from the summit towards Baltimore, there is no stream of consequence at command until we arrive at Elkridge Landing, where a supply from the Patapsco will furnish, abundantly, the

distance to Baltimore. It is hoped that this may be done without injury to the extensive Avalon Iron Works situated on this river.

The last season afforded a most favorable opportunity of ascertaining the minima quantities of water afforded by the streams above-mentioned. By the end of June, a long continuance of dry weather, aided by the great draught of the previous year, had reduced all the streams of this section of country very low. The rain which fell the first days of July had a very temporary effect upon them; but they again subsided so fast, that, by the beginning of August, they were so much reduced, that several cotton mills in the State, whose supply of water has hitherto been deemed most ample at all seasons, were compelled to intermit their work; and many of the inhabitants, led by occupation to remark such particulars, observed that the waters were then lower than at any previous time within their recollection. The rain in the first week of August, although amounting to 1.40 inch, was also productive of only very temporary effects; and, by the beginning of September, the streams were as low or lower than before. The following table presents the results of the principal guagings of them made during the Summer; those being rejected in which there was reason to believe that, from accidental circumstances, confidence could not be placed:

NAME OF STREAMS.	DATE.	WHERE GUAGED.	METHOD USED.	Discharge cubic feet per second.
Patuxent - -	July 7	Near Edmonston's Mill, 3 miles above turnpike road	Section -	55.6
do - -	12	$\frac{1}{2}$ mile above Snowden's Mill	do	72.5
do - -	26	Near Edmonston's Mill	do	36.7
do - -	31	Below turnpike road	do	34.4
do - -	Aug. 2	Near Edmonston's Mill	do	26.5
do - -	7	do do	do	53.7
do - -	15	do do	do	72.3
do - -	20	do do	do	32.6
do - -	24	do do	do	29.7
do - -	Sept. 7	Below turnpike road	do	28.8
North Branch Patuxent	May 22	Savage Factory	do	25.2
do - -	29	do do	do	35.3
do - -	June 11	do do	do	23.8
do - -	July 2	do do	do	49.9
do - -	9	do do	do	37.5
do - -	29	Below turnpike road	do	17.5
do - -	Aug. 3	do do	do	14.4
do - -	8	do do	do	21.7
do - -	15	do do	do	30.4
do - -	18	do do	do	16.
do - -	22	do do	do	17.5
do - -	Sept. 7	Savage Factory	Estimated	12.
Hammond's Branch	8	At turnpike road	Dam -	0.26
Saw Mill Branch	11	do do	do	0.34
Chandler's Run	8	Near end of deep-cut	do	0.68
Piney Branch	July 19	Near Herbert's Mill	Section -	0.41
Northeastern Branch	Sept. 20	On Prater's Farm	Dam -	3.27
do - -	July 18	Near Bladensburg	Section -	19.5
Northwestern Branch	18	do do	do	23.8
Deep Run	13	$1\frac{1}{2}$ miles from mouth	do	2.5
do - -	24	Below paper mill	do	1.6

The estimate made, September 7, of the quantity of water afforded by the North Branch of Patuxent, was founded on the quantity consumed by the Savage Factory when in operation, which was measured. It was found that the whole supply of the stream for 24 hours, was just adequate to keep the machinery in action for 12 hours; the dam being capacious enough to accumulate during the night a quantity sufficient to remove the deficiency during the day. The irregularity of the stream at this time, from the water being held up occasionally by the numerous mills above, rendered a resort to this mode of estimating necessary.

In examining into the sufficiency of this supply of water, we will first consider the summit level. This, as before stated, will be $12\frac{7}{8}$ miles in extent; but, as from its two ends, there will be some distance of canal before receiving any further supply of water, it will be necessary to consider these intervals in connexion with the summit. They will be, respectively, $3\frac{1}{4}$ miles towards the Potomac, and $3\frac{7}{8}$ miles towards Baltimore; adding the two feeders of $1\frac{1}{2}$ and $\frac{3}{4}$ miles, will give a total distance of $22\frac{1}{2}$ miles to be supplied by the following streams, which may be relied on to afford, at the driest times, the quantities of water below:

Main Patuxent,	-	-	26.5	cubic feet per second,
North Branch Patuxent,	-	-	12.	
Hammond's Branch,	-	-	0.26	
Saw Mill Branch,	-	-	0.34	
Piney Branch,	-	-	0.41	
Chandler's Branch,	-	-	0.68	
				<hr/>
Total,	-	-	40.19	cubic feet per second.

If we allow for the consumption of the canal, for lockage, evaporation, and filtration, $1\frac{1}{2}$ cubic feet per second per mile, which appears a far more ample allowance than will be needed for a canal placed in the favorable circumstances for retaining water of the present one, we have 33.75 cubic feet required for the supply of $22\frac{1}{2}$ miles; leaving a surplus of 6.44 cubic feet per second. If we reflect that these measurements were taken during a season of almost unparalleled drought, and that the allowance for the wants of the canal is a maximum, it will become a matter of consideration, in constructing the work, to ascertain if the water of the North Branch cannot be dispensed with, and thereby avoid the necessity of interfering with the valuable grist and saw mills which occupy the second fall at the Savage Factory; or, otherwise, to make conditional arrangements to require this supply only during a time of scarcity; leaving these mills at other times unimpeded.

It is to be remarked, that, should it be wished, at any future period, to increase the supply of water during the dry season by means of reservoirs, there are numerous situations in the different valleys for doing this with facility and to a great extent. The valley of Hammond's Branch may be mentioned as affording several favorable sites for similar works.

In descending towards the Potomac, the canal will receive additional supplies from the Northeastern Branch until it reaches the neighborhood of Bladensburg, where, as already remarked, it can command the waters of the Northeastern and Northwestern Branches united, which will be more than sufficient for its supply to the point to which it will be furnished by the Potomac.

In proceeding towards Baltimore, from the point above fixed, the canal will be further supplied for one and a half miles by Deep run, affording July 13, 2.5 cubic feet per second. From Elkridge Landing to Baltimore, 7 $\frac{1}{4}$ miles, it will depend on the Patapsco. It was not thought necessary to make any careful measurements of this river, as its supply was considered as much more than sufficient for this short distance.

From these premises, therefore, we draw the conclusion, that this canal can be amply supplied with water, throughout its whole extent, and at all seasons.

In obedience to the instructions of the Board of Internal Improvement, to pay a due attention, in case of the line of the canal approaching the city of Washington, to the practicability of connecting it by an embranchment with the United States' Navy Yard, I made a survey with a view to ascertain the practicability of forming this connexion parallel to, and along the shore of, the Eastern Branch, quitting the main canal near the present toll-gate on the Maryland Avenue. The ground which would have to be passed over, on such a plan, offers so many difficulties, as to leave little doubt but that the most expedient connexion with the Navy Yard would be, by passing to the west of the Capitol, at the proper elevation, on the declivity of the hill, and thence, nearly in a direct line, to the desired point. A survey of this route was not made, as the situation of the ground left no doubt of the practicability of effecting it. The importance which it would afford for the construction of dry docks, in addition to its other advantages, would render this appendage of the greatest utility to this establishment.

My attention was also directed, by the instructions of the Board, to the facilities afforded by the ground and the line of canal, to erect, in time of emergency, a temporary line of defensive works. A reference to the map No. 1, will shew that the line passes considerably within the limits of the city: it however includes between it and the Potomac, all the thickly built part, and it will probably be some time before the ground to the north of this line will be densely inhabited. For the greater part of the distance between the Eastern Branch and Rock creek, the line passes where deep cutting will be necessary, and will thus afford an opportunity of easily forming, merely by a proper disposition of the earth which must be excavated, a formidable barrier of defence. Towards the Eastern Branch, some additional military works will be necessary to give this portion of the line the same strength that the remainder will necessarily possess from its peculiar situation. These works combined, insulating the city of Washington, would form for it a strong defensive barrier, more effectual,

perhaps, than could be obtained by pretty extensive works executed for this only object.

I now proceed to offer the estimate of the probable cost of this work, which has been made in conformity with the estimate of the Chesapeake and Ohio canal, the prices being altered as required by local circumstances. In conformity to the plan of that canal, the present one is intended to be forty-eight feet wide at the surface of the water, (exclusive of the surf-berm on each side on a level with the surface,) thirty-three feet at bottom, and five deep. The locks to be 104 feet from heel-post to heel-post, and 14 feet wide in the clear, the walls of which to be constructed of faced stone, carefully bonded, and laid in water cement.

ESTIMATE of the probable cost of a Canal from the Potomac, at Rock Creek, to Baltimore.

No.	Distance. Yards.	Distance from beginning. M. Yds.	Distance to station.		Amount.
1	983	M. 983	4	Aqueduct across Rock Creek, 50 feet span Excavation 131,722 cubic yards, at 27 cents Do 52,099 do at 17 cents Embankment 5,200 do at 20 cents	\$29,715 00 35,564 94 6,772 87 1,040 00
2	140	1123	5	Excavation 8,680 do at 16 cents	-
3	550	1673	8	Do 55,550 do at 16 cents	-
4	370	1 283	10	Do 52,540 do at 18 cents	-
5	350	1 633	12	Do 92,000 do at 22 cents	-
6	464	1 1097	15	Do 111,360 do at 22 cents	-
7	1024	2 361	22	Do 208,896 do at 22 cents	-
8	1007	2 1368	28	Do 151,050 do at 20 cents	-
9	286	2 1654	31	Do 6,292 do at 13 cents	-
				Aqueduct Tiber creek	817 96
				Embankment 3,140 cubic yards, at 20 cents	1,460 00
					628 00
10	554	3 448	36	Excavation 77,560 do at 18 cents	-
11	840	3 1288	40	Do 18,900 do at 13 cents	-
				Two culverts, at 400	2,457 00 800 00
					\$ 73,092 00 1,388 80 8,888 00 9,457 20 20,328 00 24,499 20 45,957 12 30,210 00 2,905 96 13,960 80 3,257 00

ESTIMATE--Continued.

No.	Distance.	Distance from beginning.	Distance to station.		Amount.
	Yards.	M. Yds.			Dollars.
12	1440	4 968	46	Bridges at passage of avenues, No. 8, at \$2,000 Excavation 145,440 cubic yards, at 18 cents - Bridge at turnpike - - - - - \$26,179 20 3,000 00	16,000 00
13	1000	5 208	51	Excavation 45,000 cubic yards, at 17 cents - 2 locks, Nos. 1 and 2, 16 feet - - - - - 7,820 00 26,400 00	29,179 20
14	1664	6 112	62	Excavation 56,508 cubic yards, at 13 cents - Embankment 23,296 cubic yards, at 22 cents - 2 culverts, at \$500 - - - - - 4,746 04 1 large do - - - - - 5,125 12 600 00 800 00	34,220 00
15	490	6 602	65	Excavation 11,270 cubic yards, at 17 cents -	11,271 26
16	202	6 804	67	Do 19,392 do at 20 cents - Puddling, 3,434 yards, at 12 cents - 3,878 40 412 08	1,915 90
17	840	6 1644	76	Walling, 10,080 cubic yards, at \$4 50 - Embankment, 26,040 cubic yards, at 22 cents - Puddling, 14,280 cubic yards, at 12 cents - 1 culvert - - - - - 45,360 00 5,728 80 1,713 60 560 00	4,290 48
					53,362 40

18	238	7	122	79	Excavation, 22,848 cubic yards, at 20 cents	-	4,569 60	5,714 40
					Embankment, 3,840 cubic yards, at 22 cents	-	844 80	3,304 80
					1 culvert	-	300 00	664 52
19	360	7	482	82	Excavation, 19,440 cubic yards, at 17 cents	-	-	1,216 80
20	134	7	616	85	Do 4,556 do at 17 cents	-	-	1,861 16
21	182	7	798	88	Do 1,320 do at 14 cents	-	184 80	1,138 32
					Embankment, 3,660 cubic yards, at 20 cents	-	732 00	
					1 culvert	-	300 00	
22	322	7	1120	93	Excavation, 10,948 cubic yards, at 17 cents	-	-	1,216 80
23	124	7	1244	95	Do 6,696 do at 17 cents	-	-	1,861 16
24	188	7	1432	97	Do 1,430 do at 17 cents	-	243 10	1,138 32
					Embankment, 3,936 do at 20 cents	-	787 20	
					Culvert	-	300 00	
25	760	8	432	108	Excavation, 41,040 cubic yards, at 18 cents	-	-	1,330 30
26	580	8	1012	114	Do 1,100 do at 18 cents	-	198 00	7,387 20
					Embankment, 18,560 do at 22 cents	-	4,083 20	
					Aqueduct	-	1,620 00	
27	440	8	1452	118	Excavation, 23,760 cubic yards, at 14 cents	-	-	5,901 20
28	222	8	1674	120	Do 7,548 do at 14 cents	-	1,056 72	5,326 40
					Farm bridge	-	300 00	
29	446	9	360	124	Embankment, 33,280 cubic yards, at 22 cents	-	7,321 60	1,356 72
					Excavation feeder, 28,600 cubic yards, at 17 cents	-	4,862 00	
					Dam	-	1,200 00	
					Aqueduct, Eastern Branch	-	45,380 00	

ESTIMATE—Continued.

No.	Distance. Yards.	Distance from beginning. M. Yds.	Distance to station.		Amount.
					Dollars.
30	840	9 1200	131	Excavation, 2,200 cubic yards, at 17 cents	374 00
				2 bridges, Bladensburg - - -	2,200 00
				Waste gate and weir - - -	800 00
					61,137 60
31	1200	10 640	138	Excavation, 18,480 cubic yards, at 16 cents	2,956 80
				Feeder from Eastern Branch and dam	3,200 00
					6,156 80
32	690	10 1330	142	Excavation, 31,200 cubic yards, at 17 cents	5,304 00
				Embankment, 81,600 do at 22 cents	17,952 00
				Lock No. 3, 8 feet - - -	13,200 00
				Aqueduct over northeastern branch	22,000 00
				Culvert - - -	300 00
				Bridge - - -	300 00
				59,056 00	
33	558	11 128	146	Excavation, 15,180 cubic yards, at 17 cents	2,580 60
				Lock No. 4, 8 feet - - -	13,200 00
					15,780 60
33	558	11 128	146	Excavation, 18,972 cubic yards, at 17 cents	3,225 24
				Embankment, 3,348 cubic yards, at 22 cents	736 56
				Lock No. 5, 8 feet - - -	13,200 00
				Culvert \$350; bridge 300	650 00
					17,811 80

34	2192	12	560	158	Excavation, 49,320 cubic yards, at 18 cents Lock No. 6, 8 feet 2 farm bridges -	- - -	8,877 80 13,200 00 600 00	22,697 60
35	1120	12	1630	164	Embankment, 116,480 cubic yards, at 22 cents Excavation, 9,240 cubic yards, at 17 cents Lock No. 7, 8 feet Aqueduct, Paint branch	- - - -	25,625 60 1,570 80 13,200 00 18,500 00	58,896 40
36	1098	13	1018	170	Excavation, 24,156 cubic yards, at 16 cents Lock No. 8, 8 feet	- -	3,864 96 13,200 00	17,064 96
37	920	14	178	177	Excavation, 31,280 cubic yards, at 17 cents Culvert - Farm bridge -	- - -	5,317 60 300 00 300 00	5,917 60
38	945	14	1123	181	Excavation, 6,380 cubic yards, at 17 cents Embankment, 20,800 cubic yards, at 22 cents Lock No. 9, 8 feet	- - -	1,084 60 4,576 00 13,200 00	18,860 60
39	724	15	87	185	Excavation, 24,616 cubic yards, at 14 cents Locks 10 and 11, 16 feet Culvert -	- - -	3,446 24 26,400 00 300 00	30,146 24
40	1362	15	1449	191	Excavation, 29,954 cubic yards, at 14 cents Lock No. 12, 8 feet Bridge - Culvert	- - - -	4,194 96 13,200 00 300 00 300 00	17,994 96

ESTIMATE—Continued.

No.	Distance.	Distance from beginning.	Distance to station.		Amount.
	Yards.	M. Yds.		Dollars.	
41	1218	16 907	198	Excavation, 31,668 cubic yards, at 16 cents Locks, Nos. 13, 14, and 15, 22 feet Bridge, turnpike road Large culverts	5,066 88 86,300 00 1,200 00 850 00
42	1004	17 151	202	Excavation, 10,846 cubic yards, at 17 cents Embankment, 51,611 cubic yards, at 22 cents 2 culverts 1 large culvert	1,843 82 11,354 42 600 00 850 00
43	870	17 1021	210	Excavation, 27,840 cubic yards, at 17 cents Embankment, 4,080 do at 22 cents Two culverts Bridge Locks Nos. 16 and 17, 14 feet	4,732 80 897 60 600 00 300 00 23,100 00
44	1168	18 429	218	Excavation, 25,696 cubic yards, at 17 cents Two culverts One bridge Lock 18, 7 feet	4,368 32 600 00 300 00 11,550 00
					29,630 40
					14,648 24
					43,416 88
					16,818 32

45	630	18 1059	221	Excavation, 13,860 cubic yards, at 17 cents Lock No. 19, 7 feet	- -	2,356 20 11,550 00	13,906 20
46	4347	21 126	254	Deep cutting, Snowden's Ridge— Excavation 1,906,210 cubic yards, at 25 cents Do back drains, &c. 78,246 cubic yds. at 17 cts.	- -	476,552 50 13,301 82	
				Bridge at turnpike	-	20,000 00	
				Bridge	-	300 00	
47	1870	22 236	266	Excavation, 41,040 cubic yards, at 17 cents Two culverts	- -	6,993 80 600 00	510,154 32
				One bridge	-	500 00	
48	376	22 612	268	Embankment, 20,304 cubic yards, at 22 cents Puddling, 6,392 yards at 12 cents	- -	4,466 88 767 04	8,093 80
				One culvert	-	1,200 00	
49	1134	22 1746	274	Excavation, 24,948 cubic yards, at 18 cents Two culverts	- -	4,490 64 600 00	6,433 93
50	495	23 481	278	Embankment, 26,730 cubic yards, at 22 cents Puddling, 6,800 do at 12 cents Aqueduct over Patuxent— 3 arches, 30 feet span	- - -	5,880 60 816 00 34,120 00	5,090 64
				Waste weir and gate	-	600 00	
51	784	23 1265	285	Excavation, 17,248 cubic yards, at 14 cents One bridge	- -	2,414 72 500 00	41,416 60
				One culvert	-	300 00	
							3,214 72

ESTIMATES—Continued.

No.	Distance.	Distance from beginning.	Distance to station.		Amount.
	Yards.	M. Yds.			Dollars.
52	2510	25 255	318	Deep cutting, middle ridge— Excavation, 1,141,344 cubic yards, at 25 cents - Do back drains, &c. 44,784 c. y. at 17 cts. Road bridge - - - - -	285,336 00 7,613 28 6,000 00 298,949 28
53	524	25 779	326	Excavation, 11,528 cubic yards, at 17 cents Dam and feeder from Hammond's branch	1,959 76 2,000 00 3,959 76
54	920	25 1699	335	Embankment, 95,680 cubic yards, at 24 cents Puddling, 15,640 yards, at 12 cents Aqueduct North Branch Patuxent— Three arches 30 feet span - - - Waste weir and gate - - -	22,963 20 1,876 80 32,460 00 600 00 57,900 00
55	730	26 779	342	Excavation, 16,060 cubic yards, at 17 cents Embankment, 4,200 cubic yards, at 22 cents Three culverts - - -	2,730 20 924 00 900 00 3,554 20
56	414	26 1073	345	Embankment, 11,040 cubic yards, at 22 cents Puddling 5,865, at 12 - - -	2,428 80 703 80

57	1414	27	727	355	One culvert	-	-	-	600 00	
					One farm bridge	-	-	-	300 00	4,032 60
					Excavation, 31,108 cubic yards at 18 cts.	-	-	-	5,599 44	
					Embankment, 1,600 cubic yards, at 22 cts.	-	-	-	352 00	
					Culvert	-	-	-	450 00	
58	1205	28	172	366	Excavation, 28,920 cubic yards, at 20 cts.	-	-	-	5,784 00	6,401 44
					One road bridge	-	-	-	500 00	
					One farm bridge	-	-	-	310 00	
					One culvert	-	-	-	300 00	
59	1740	29	152	380	Excavation, 41,760 cubic yards, at 20 cts.	-	-	-	8,352 00	6,884 00
					Two culverts	-	-	-	600 00	
60	3874	31	506	419	Deep cutting Waterloo Ridge—	-	-	-		8,952 00
					Excavation, 1,557.126 cubic yards, at 25 cts.	-	-	-	389.281 50	
					Do back drains, &c. 69,782 c. y. at 17 cts.	-	-	-	11,854 24	
					Bridge road	-	-	-	6,000 00	
61	1730	32	476	433	Excavation, 58,060 cubic yards, at 17 cts.	-	-	-	6,470 20	407,035 74
					Embankment, 2,400 do at 22 cts.	-	-	-	528 00	
					One culvert	-	-	-	400 00	
					Locks Nos. 20, 21, 22, 21 feet	-	-	-	34,650 00	
62	820	32	1296	435	Excavation, 19,680 cubic yards, at 17 cts.	-	-	-	1,377 60	42,048 20
					Locks Nos. 23, 24, 14 feet	-	-	-	28,100 00	
					Bridge	-	-	-	300 00	
					Culvert	-	-	-	300 00	25,077 60

ESTIMATE—Continued.

No.	Distance. Yards.	Distance from beginning. M. Yds.	Distance to station.		Amount.
					Dollars.
63	818	33 384	441	Excavation, 27,136 cubic yards, at 18 cts.	4,884 48
				Culvert - - - - -	420 00
				Locks Nos. 25, 26, 27, and 28, 31 feet - - -	51,150 00
				Two culverts - - - - -	600 00
					57,054 48
64	940	33 1324	447	Excavation, 30,960 cubic yards, at 18 cts.	5,652 80
				Lock 29, 8 feet - - - - -	13,200 00
				Culvert - - - - -	300 00
				Bridge - - - - -	500 00
					19,652 80
65	1228	34 792	458	Excavation, 39,296 cubic yards, at 17 cts.	6,680 32
				Locks Nos. 30, 31, and 32, 24 feet - - -	39,600 00
				Two culverts - - - - -	600 00
				Bridge - - - - -	300 00
					47,180 32
66	1182	35 214	466	Excavation, 20,368 cubic yards, at 17 cents	4,822 56
				Lock No. 33, 8 feet - - - - -	13,200 00
				Two culverts - - - - -	600 00
				Bridge - - - - -	300 00
					18,922 56
67	1756	36 210	475	Excavation, 38,632 cubic yards, at 18 cents	6,953 76

68	776	36	986	480	Locks 34 and 55, 16 feet Two culverts Two bridges	- - -	- - -	26,400 00 600 00 800 00	34,753 76
					Excavation, 26,384 cubic yards, at 18 cents Bridge Two culverts	- - -	- - -	4,749 12 500 00 600 00	
69	432	36	1398	484	Embankment, 14,620 cubic yards, at 22 cents Aqueduct over Patapsco, 5 arches Lock 36, 8 feet Feeder from Patapsco Dam Waste-gate and weir	- - - - - -	- - - - - -	3,216 40 59,307 00 15,200 00 3,484 80 3,000 00 600 00	5,849 12
70	1010	37	648	489	Excavation, 22,220 cubic yards, at 17 cents Bridge Culvert	- - -	- - -	3,777 40 300 00 300 00	82,808 20
71	452	37	1100	493	Excavation, 24,408 cubic yards, at 18 cents	-	-	-	4,377 40
72	1192	38	532	499	Excavation, 26,224 cubic yards, at 17 cents One culvert, 300; one bridge, 300	- -	- -	4,458 08 600 00	4,893 44
73	760	38	1292	502	Excavation, 25,840 cubic yards, at 18 cents	-	-	-	5,058 08
74	160	38	1452	504	Embankment, 8,640 cubic yards, at 20 cents Culvert	- -	- -	1,728 00 800 00	4,651 20
75	648	39	360	508	Excavation, 20,736 cubic yards, at 18 cents Bridge	- -	- -	3,732 48 300 00	2,528 00 4,032 48

ESTIMATE—Continued.

No.	Distance.		Distance from beginning.	Distance to station.			Amount.
	Yards.	M.	Yds.				Dollars.
76	260	39	620	511	Embankment, 14,040 cubic yards, at 28 cents	-	2,808 00
					Culvert - - - - -	-	800 00
					Road bridges - - - - -	-	600 00
77	1370	40	230	521	Excavation, 30,140, cubic yards, at 17 cents	-	5,123 80
					Culvert - - - - -	-	300 00
78	1466	40	1696	533	Excavation, 152,464 cubic yards, at 20 cents	-	30,492 80
					Road bridge - - - - -	-	1,200 00
79	2324	42	500	547	Excavation, 74,368 cubic yards, at 19 cents	-	13,386 24
					Three culverts - - - - -	-	900 00
80	390	42	890	549	Excavation, 8,580 cubic yards at 18 cents	-	-
81	862	42	1752	556	Excavation, 206,514 cubic yards, at 22 cents	-	45,433 08
					Do. back drains, &c. 15,716, at 17 cents	-	2,671 72
82	620	43	612	563	Excavation, 132,220 cubic yards, at 22 cents	-	29,088 40
					Do. back drains, &c. 11,484 cubic yards, at 17	-	1,952 28
							48,104 80

83	500	43	912	565	Excavation, 5,097 cubic yards, at 17 cents	-	1,036 49	
					Embankment, 637 cubic yards, at 18 cents	-	114 66	
					Road bridge	-	500 00	
					One culvert	-	300 00	1,951 15
84	568	43	1480	567	Excavation, 19,728 cubic yards, at 17 cents	-	3,363 76	
					Large culvert	-	520 00	
					Three culverts	-	900 00	4,783 76
85	964	44	684	573	Excavation, 32,776 cubic yards, at 17 cents	-	5,571 92	
					Three culverts	-	900 00	
					One bridge	-	300 00	6,771 92
86	660	44	1344	End	Embankment, 68,788 cubic yards, at 26 cents	-	17,884 88	
					Puddling, 10,081 yards, at 12 cents	-	1,209 72	
					Paving, 1,186 yards at 18 cents	-	960 66	
					Aqueduct	-	4,066 00	
					Excavation, 9,180 yards, at 17 cents	-	1,560 60	
					Paving, 340 yards, at 81 cents	-	275 40	
					Locks Nos. 37 and 38, 17 feet	-	27,540 00	53,497 26
					Fencing 42 miles of canal, both sides, at \$ 900	-	-	\$2,801,071 81
					Superintendence, contingencies, &c. 5 per cent.	-	-	37,800 00
					Amount of estimates	-	-	2,838,871 81
						-	-	141,943 59
						-	-	\$2,980,815 40

It is necessary to observe, in relation to the above estimate, that it has been made on the supposition of all the works being executed in the most durable and workmanlike manner, and of the best materials which the neighboring country will afford for the purpose. The estimate has also been intentionally made high, so as to ensure that the work may be made for a sum within its limits, more or less, according as the contingencies may prove favorable or unfavorable.

On the examination of the country towards Annapolis.

Your orders of the 25th of October, 1826, directed me to make an examination of the country lying between the district we were operating in, and the city of Annapolis, with a view of connecting that city with the proposed canal. A slight examination convinced me of the impracticability of forming such a connexion between any valley leading into the Patapsco, and a valley leading into the Severn, without going so far to the east as would carry me much beyond the limits contemplated in my instructions. My attention was then directed to the possibility of making a communication between the valley of the Patuxent and that of the Severn. With this view, I carefully examined the ridge dividing the tributaries of these two rivers, extending from about four miles to the southeast of Waterloo, to the neighborhood of Annapolis. Throughout the whole extent of this ridge, I only observed one place that appeared favorable to the object. Between six and seven miles from Waterloo there is a wet swamp on either side of the road, from which the ground declines both to the right and left, having a branch of the Severn about three-quarters of a mile on the northeast, and the North Branch of the Patuxent about two miles in a direct line to the southwest, but between four and five miles to the southward, in following the valley of Rogues' Harbor Branch, which heads in this swamp.

From a careful view of the ground, this depression of the ridge appears to be lower than that previously described, through which the canal, as we located it, would pass to reach the Patapsco; and seems to offer considerable facilities for forming a branch of canal on the same level as the summit of the principal line, and leaving this line near the mouth of Chandler's run, to continue along the valley of the North Branch, until a favorable situation occurred for passing over to the valley of Rogues' Harbor Branch; then, continuing up this last valley, always on the same level, until it should begin to descend to the Severn. The greatest obstacle to this plan, appears to be offered by the high isthmus, which lies between the North Branch and Rogues' Harbor Branch, which would, perhaps, require the line of canal to be carried near to the confluence of these streams, in order to preserve the proper level, and to avoid the alternative of encountering very deep-cutting. The valley of the Severn, once attained, there is no doubt of the practicability of continuing the canal along its bank as far as the harbor of Round Bay. This superb haven, having already had the attention of Government directed to it, as a suitable

situation for a Naval depôt, renders the termination in it of a canal communicating with Washington and Baltimore, an important and interesting consideration.

From the depression of the ground, of which I have been speaking, until near Annapolis, the ridge appears to be composed principally of a succession of high hills, much broken by deep ravines and valleys, but none of these extending so nearly from river to river as to offer sufficient encouragement for a further examination.

The possibility of forming a connexion between the Severn river and Eastern Branch, through the medium of South river, naturally presented itself for consideration, and, in consequence, I was led to make the necessary observations, to satisfy me on this head, and to make an examination of the ground lying between South river and the Pautuxent. On approaching the head of South river, from the direction of Annapolis, the general face of the country gradually rises, and becomes intersected by deep and narrow ravines. Some of these ravines approach pretty near to corresponding ravines, discharging into Severn, but none sufficiently so as not to require an excessive deep-cutting to connect them by a canal at a low level. (which the deficiency of the streams in the neighborhood would make necessary;) while the soil is extremely unfavorable to a work of this kind—being so light as to be easily washed into deep gulleys; which, indeed, is the mode of formation of the ravines in question.

The ground between South river and the Pautuxent, partakes of the character above described, but not in so great a degree. There appears to be a continuous depression, extending from South river over to Patuxent; but a careful view of it convinced me that is not sufficiently low to be commanded by any of the streams in the neighborhood.

In fine, the result of this examination is the conviction that the only route that offers a reasonable probability of forming a water communication between the Severn and Eastern Branch, either directly or through the medium of another canal, is that particularly abovementioned, as passing by the depression of the ridge which intervenes between the head of Rogues' Harbor Branch, and a branch of the Severn.

In concluding this report, I render an act justice in expressing my acknowledgments to my assistants, for the zeal, intelligence, and industry, with which they have afforded me their aid. Mr. J. F. Swift and Mr. F. Harrison, jr. at the head of their respective parties, assisted by Mr. Miller and Mr. Wall, as surveyors, gave every satisfaction. The two first named gentlemen, have also platted the work, and drawn the profiles of the same. Mr. Harrison has also made the drawings of the maps, which confer great credit upon him, not only for the neatness of their execution, but also for the fidelity of their topography.

All which is respectfully submitted.

WM. HOWARD,
Assistant Civil Engineer.

GEORGETOWN, D. C. *June 25th, 1827.*



CHESAPEAKE AND OHIO CANAL—EXTENSION OF

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

A REPORT, MAP, AND ESTIMATE,

OF THE

CHESAPEAKE AND OHIO CANAL TO ALEXANDRIA,

IN THE

DISTRICT OF COLUMBIA.

APRIL 21, 1828.

Referred to the Committee on Roads and Canals.

WASHINGTON :

PRINTED BY GALES & SEATON.

1828.

WAR DEPARTMENT, *April 18, 1828.*

SIR: I have the honor to transmit, herewith, a letter of the Chief Engineer, of this date, accompanied by a report, map, and estimate, of an extension of the Chesapeake and Ohio Canal to Alexandria, in the District of Columbia, called for by a resolution of the House of Representatives, of the 9th instant.

I have the honor to be, very respectfully,

Sir, your obedient servant,

JAMES BARBOUR.

Hon. ANDREW STEVENSON,

Speaker of the House of Representatives.

ENGINEER DEPARTMENT,

Washington, April 18, 1828.

SIR : In pursuance of your orders, I have the honor to transmit, herewith, the report, map, and estimate, of a survey of an extension of the Chesapeake and Ohio canal to Alexandria, in the District of Columbia, which was called for by a resolution of the House of Representatives. of the 9th instant.

I have the honor to be very respectfully, Sir,

Your obedient servant,

ALEX MACOMB,

Major General, Chief Engineer.

HON. JAMES BARBOUR.

Secretary of War.

Second Mile.

30X230= 6,900	-	Deep valley	-	10	690
70X302=21,140	-	Valley, 21 feet deep	-	12½	2,640
53X128= 6,784	17,802	Great embankment	-	18	3,204
33X204= 6,732					
30X 59= 1,770					
11X 60= 660					
16X116= 1,856	26,594	Sloping Common excavation Six culverts Two road bridges A long culvert	-	10	2,655 1,800 400 600
207X 27= 5,589					
1,310X 16=20,960					
					<u>11,989</u>

Third Mile.

70X427=29,890	-	Gravelly Creek valley	-	18	5,380
30X200= 6,000	-	Embankment	-	10	3,013
53X128= 6,784	-	do	-		
667X 41=27,347	-	Sloping	-	11	1,463
367X 36=13,212	-	Deep cutting	-	10	917
573X 16= 9,168	-	Common excavation	-	-	600
	-	Two culverts	-	-	400
	-	Two bridges	-	-	700
	-	Culvert for Gravelly creek	-	-	
					<u>12,473</u>

ESTIMATE—Continued.

Fourth Mile.

Yards. cub. yds.	Amount c. y.	Descriptions.	Cents.	Dollars.
40X163=	6,720	Deep cutting -	16	1,075
80X144=	11,520	-	-	-
89X134=	11,926	-	-	-
87X86=	7,482	Deep cutting, 33,728 -	14	4,722
70X40=	2,808	-	-	-
93X48=	4,464	Embankment -	16	714
1,301X20=	26,020	Part common excavation—slope	10	2,602
-	-	Two culverts -	-	600
-	-	Two road bridges -	-	600
-	-	-	-	<u>10,313</u>
-	-	-	-	<u>714</u>

Fifth Mile.

200X32=	6,400	Sloping surface -	10	640
33X154=	5,032	Embankment -	14	711
36X80=	2,880	-	-	-
66X70=	4,620	Embankment -	12½	1,446
107X83=	4,066	-	-	-
36X122=	4,392	-	-	-
72X48=	3,456	Deep cuttings -	14	1,098
26X36=	936	Embankment -	12½	117
1,184X17=	20,128	Common excavation -	10	2,013
-	-	Four culverts and one bridge -	-	1,500
-	-	-	-	<u>7,525</u>

ESTIMATE—Continued.

Eighth Mile.

Yards, cub. yds.	Amount c. y.	Descriptions.	Cents,	Dollars.
96×181=17,376 }		A valley—29,379	15	4,406
160×75=12,000 }		Two valleys }	10	1,197
133×90=11,970 }		Deep cutting }	12½	1,642
180×73=13,140 }		do }	10	2,446
100×70=7,000 }		Common excavation }		600
1,991×16=17,456 }		Two culverts - }	-	600
		A longer culvert - }	-	400
		Two road bridges - }	-	
				<u>11,291</u>

Ninth Mile.

100×103=10,300 }		Embankments, 11,044 -	11	1,215
12×62=744 }				
107×78=8,346 }		Deep cuttings, 14,046 -	14	1,966
150×38=5,700 }				
1,391×16=22,256 }		Common excavation -	10	2,226
		Four culverts and a road bridge -	-	1,500
		Three farm bridges -	-	600
				<u>7,507</u>

20X128= 2,560	}	20,480	}	10	2,048
10X 30= 300					
10X103= 1,030					
200X 36= 7,200					
626X 15= 9,390					
-	Embankment	-	-	-	-
-	Deep cutting	-	-	-	-
-	Common excavation	-	-	-	-
	Three culverts	-	-	-	900
					<u>2,948</u>

RECAPITULATION.

1st mile	\$ 23,485
2d do	11,989
3d do	12,473
4th do	10,813
5th do	7,525
6th do	9,381
7th do	30,561
8th do	11,291
9 h do	7,507
Remainder	<u>2,948</u>

Total	127,473
600 for three waste weirs	600
1,000 a sum for grubbing	1,000
29,600 for lockage, equalling \$ 800 per foot, or \$ 7,400 each, for four locks, 9 feet, 3 inches lift, each	<u>29,600</u>

\$ 158,673 Total amount for canal and locks, without any allowance for fencing.

An estimate of the cost of making said canal five feet deep, forty feet surface, and twenty-five feet bottom; slope of the banks, one foot and a-half base, to one foot perpendicular.

One foot in depth, taken from the bottom of the canal of four feet deep, &c. would require the removal of nearly three cubic yards, for each yard in length, in most cases of excavation: but in the *embankments*, a like quantity would be saved.

The embankments, together, measure 2,000 yards nearly, which, compensating for a like length of excavation, 4,000 yards, is taken from 16,706 yards, (total length) and there remains 12,706 yards \times 3 cubic yards = 38,118 cubic yards, which, coming from the *bottom*, may require to be put at $12\frac{1}{2}$ cents the cubic yard; this makes the sum of \$ 4,765, which, being added to the total amount above, produces a total of \$ 163,438 for said canal, if made five feet deep, &c.

From measurements and soundings of the Potomac river, made in pursuance of directions of the Corporation of Georgetown, by Mr. George D. Avery, the place called the "*Three Sisters*" is shown to be a very unsuitable one, for a bridge of any kind. There is a distance of two hundred and sixty-two feet, which is over twenty feet deep—deepest part, seventy-six feet. In this deep water, the bottom is reported "*soft*," and the depth, to a solid foundation, is unknown.

By inspection of the *cross section* of the river, (accompanying this,) at a place just above the ferry, the greatest depth appears to be but fifteen feet at flood-tide, and the width but one hundred and five feet more, than at the *Three Sisters*.

The average depth of water above the ferry, may be put, at *ebb-tide*, eight feet; distance across, one thousand and forty feet. An aqueduct located at this place, would strike the west bank below that precipitous rocky shore which has so raised the estimate of the first mile. The sum thus saved on the *canal line*, would be full twenty thousand dollars.

Particular examinations of the nature of the bottom would be requisite, to enter into any calculation of the cost of an aqueduct over the Potomac at this place. The cost of the Rochester aqueduct over the Genesee river, exceeded one hundred dollars the foot run: *length* eight hundred and two feet; *cost* eighty-seven thousand one hundred and twenty-seven dollars. The Rochester aqueduct measures, from the top-water line to the rocky bottom on which it stands, but twenty-four feet. To eight feet, (average depth at low-tide,) add thirty-seven feet, (the height proposed above the *ebb-tide*) and the top-water line of this aqueduct would be forty-five feet above the averaged bottom—over *double* the height of the Rochester aqueduct. The item of pile-driving, to make sure foundations for piers and abutments, would probably be a considerable one. The cost of the whole project, would, likely, fall little short of three hundred thousand dollars.

If a canal between Georgetown and Alexandria were made to pursue the most economical route, as has been done along the shores of the tide-water between Medford and Boston, or between Troy and

Albany, and the idea of supplying water to the higher streets of Alexandria relinquished, a very different plan would present itself.

Let the river surface, by a dam above the ferry at Georgetown, be raised to a level of eight feet above that of ebb-tide, and a canal conducted on said level to Alexandria.

Such a canal would probably fall short of eight miles in length. Its bank would have its basis in the edge of the river, the whole distance, except in passing Alexander's island, and some alluvial flats below Four Mile run.

A conjectural estimate of the cost of such a canal may be made as follows :

A bank based in the river edge for six miles, at 35,200 cubic yards per mile=211,200 cubic yards, at 10 cents	\$21,120 00
Two dollars the yard run for a paving to protect from the abrasion of the waves, $(1,760 \times 6 \times \$2) =$	21,120 00
Across the bay at the mouth of Four Mile run, may measure 650 yards \times 90 cubic yards* = 58,500 cubic yards at 20 cents	11,700 00
2,870 yards (that remains of 8 miles) of common excavation, along Alexander's island, &c. at 13 cubic yards = 37,310 cubic yards at 8 cents	2,985 00
A dam across the Potomac, about	20,000 00
Two culverts	600 00
A waste-weir at Four Mile run	400 00
Two road bridges and two farm bridges	550 00
One eight feet lock	6,400 00
Total,	<u>\$84,875 00</u>

A towing-path bridge over the Potomac is yet unprovided. A road-bridge at Georgetown has long been contemplated ; and to this might be attached a bridge for the towing-horses to pass on, a proper distance above the proposed dam, as has lately been done on the Champlain canal, for passing the *Hudson*, above the dam at the head of Saratoga Falls, and the *Mohawk*, above the dam below the Cohoes Falls.

A towing-path bridge erected with such aid, would cost much less than the value of the water power, created by the erection of the dam. On each shore, hydraulic establishments, of great value in such a situation, might be located.

As locks from the canal into the river at Georgetown would, in all probability, be constructed, whether a canal was made to Alexandria or not, the cost of locking twenty-nine feet from the canal surface to the dam surface, is not taken into the estimate of this project.

* This calculation is for a mound, acting as a dam, the top wide enough for a towing-path across this bay ; if a canal carried over on an embankment should be found indispensable, the cost of crossing this bay would be more than doubled.

A Wooden Aqueduct, &c.

An aqueduct has been proposed here, of the description of those on which the Erie canal crosses and recrosses the Mohawk river, to wit: a wooden trunk, resting on stone piers and abutments.

The averaged cost of these two aqueducts was a little over fifty dollars the foot run; foundations of both upon a rock bottom, and the water very shallow, affording every facility for a cheap and secure foundation.

No such work as that here proposed has been erected in our timber country, but *calculations* for building piers in tide water, between Baltimore and Havre de Grace, are to be found in the report of Messrs. Bland, Winchester, and Patterson, made to the General Assembly of Maryland, 1823. The cost of the foundation of a pier in said report, is put at \$93 60.

The aqueduct here proposed must be 17 feet higher the averaged elevation of the two Mohawk aqueducts; but the above foundations, as they are calculated, bring the work from the bottom to the surface at low tide; therefore the cost of but *nine* feet in height, ought to be added to each pier.

A calculation of the cost of this aqueduct may stand as follows:

Length of the aqueducts	1.040 feet	×	\$50	=	-	-	\$52,000 00
Foundations for 26 piers	26	×	\$93 60	=	-	-	2.434 00
Additions to height of 26 piers	60* yards	×	\$3	×	26	=	4,680 00

Whole cost of the aqueduct	-	-	\$59,114 00
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From the cost, as estimated, of the canal, (\$163,438,) take \$20,000 saved, by not crossing at the "Three Sisters," and there will be remaining	-	-	\$143,438 00
To which add the above cost of the aqueduct	-	-	59,114 00

And the whole cost of this project is	-	\$202,552 00
- From said sum deduct the cost (as above) of the <i>low level</i> project	-	84,873 00

And the remainder is	-	-	\$117,679 00
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Which expense is to be incurred for watering Alexandria three streets higher up, and obtaining abas infor sea vessels; add further to said expense, that of navigating, forever, a longer canal.

The survey and levels, map and profile, were made by Captain Hartman Bache, assisted by Lieutenants J. D. Graham, Boyce, and Wragg.

Very respectfully submitted by your obedient servant.

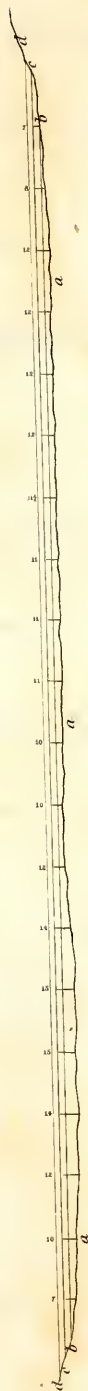
JAS. GEDDES, *Civil Engineer.*

* The cost of a cubic yard of *such* masonry gathered from the opinions of builders in Georgetown.





VERTICAL CROSS SECTION OF THE POTOMAC RIVER JUST ABOVE
THE GEORGETOWN FERRY



References

a. a. Bottom of the river

b. b. Water line at low tide

c. c. Water line at usual high tides

d. d. Water line at highest freshets

Scale, 150 feet to 1 Inch



ACT—STATE OF MARYLAND.

AN ACT

OF THE

GENERAL ASSEMBLY OF MARYLAND,

ENTITLED

A FURTHER SUPPLEMENT TO THE ACT,

ENTITLED

“An act for the Promotion of Internal Improvement.”

MARCH 17, 1828.

Referred to the Committee of the Whole House to which is committed the *bill authorizing a subscription of Stock in the Chesapeake and Ohio Canal Company.*

WASHINGTON :

PRINTED BY GALES & SEATON.

1828.



A further supplement to the act, entitled "An act for the Promotion of Internal Improvement."

Whereas by the act, entitled "A supplement to the act, entitled an act for the promotion of Internal Improvement," passed at December session, eighteen hundred and twenty-six, chapter two hundred and twenty-one, it is, amongst other things, provided, that one of the conditions upon which the Treasurer of the Western Shore shall be authorized to subscribe for five thousand shares in the capital stock of the Chesapeake and Ohio Canal Company, is, that whenever the United States shall have authorized subscriptions for not less than ten thousand shares of the capital stock of the Chesapeake and Ohio Canal Company; and whereas it is important, with reference to the interest of the State, that the grant already made by her, to that company, should be made dependent upon such other conditions and restrictions, as will effectually secure the completion of this work, if ever commenced, and the previous payment of the instalments upon all other subscriptions; and that some mode of payment of the subscription already made, should be provided, having reference to the exhausted condition of the Treasury, in lieu of the mode of payment provided by the terms of the original subscription: Therefore,

SEC. 1. *Be it enacted by the General Assembly of Maryland,* That the Treasurer of the Western Shore be authorized to subscribe the aforementioned five thousand shares of the capital stock of the Chesapeake and Ohio Canal Company, whenever the commissioners, their successors, or a majority of them, appointed on the part of this State, to aid in opening books, and taking subscriptions to the stock of said company, shall certify that the sum of two millions five hundred thousand dollars has been subscribed by bona fide subscribers, with such additional securities, as to them may be deemed ample, to ensure the faithful compliance on the part of the subscribers of the aforesaid two millions five hundred thousand dollars: and provided, also, that the instalments thereon, similar to that required to be paid on behalf of the State, and all the previous instalments, which may have accrued thereon, shall have been paid, before any payment shall be demanded on account of the State's subscription.

SEC. 2. *And be it enacted,* That the said subscription is authorized and directed upon the condition, that the said President and Directors of the said Chesapeake and Ohio Canal Company, shall certify to the said Treasurer, their agreement, under the corporate seal of said company, to accept and receive, in payment of the instalments which may become due on any such subscription, as they may be called for, certificates of stock of the State of Maryland, at par, irredeemable for fifteen years, and bearing an interest of five *per centum per annum*, payable quarterly, to commence at the end of

one year after the same shall have been issued in succession; and that, upon any such subscription being made, the said Treasurer is further authorized and directed to borrow, on the credit of the State, on the best obtainable terms, from time to time, the funds necessary to meet and discharge the first advance, and each successive payment, whensoever and as often as any instalment on the said subscription of the State shall be demanded, and become due, in conformity to the provisions of the charter of the said company; and to issue for the same, certificates of stock of the State, bearing interest at the rate of five per centum per annum, payable quarterly: provided, that the said stock shall be redeemable at the pleasure of the State, at any time after fifty years from each successive issue of certificates as aforesaid; and the premium, if any, on each and every of the said loans, shall be invested in some safe and productive stock, at the discretion of the said Treasurer, with the advice and consent of the Governor and Council, for the time being; and the interests, dividends, or profits, arising from such investment, or investments, shall be reinvested, as aforesaid, for the eventual redemption of the said loans; and the said funds, when obtained under the authority of this act, the said Treasurer is hereby directed to pay to the order of the President and Directors of the Chesapeake and Ohio Canal Company, in conformity to the provisions of the charter of the said company, and to receive therefor the necessary acquittances; or, in case it shall be deemed more beneficial to the interest of the State, in the estimation of the said Treasurer, with the approbation and concurrence of the Governor and Council, the said Treasurer shall be, and he hereby is, authorized and directed, whensoever and as often as any instalment on the said subscription of the State shall be demanded, and become due, in conformity to the provisions of the said charter, to issue certificates of stock of the State, at par, irredeemable for fifteen years, bearing interest at the rate of five per centum per annum; the said interest upon such certificates, to commence at the end of one year after the same shall have been issued, in succession, and to be paid quarterly thereafter; and the said Treasurer is authorized and directed to cause the said certificates to be delivered to the person or persons authorized to receive the said instalments, as they shall severally become due, and to demand and receive, from such person or persons, upon the delivery of the said certificates, a full acquittance and discharge for and on behalf of the State, for the instalment for which the said certificates were issued: provided, always, that, in case a premium of five per centum, or exceeding five per centum, may be obtained upon any loan required for any instalment as aforesaid, that then, and in that case, it shall be the duty of the said Treasurer, with the advice and consent of the Governor and Council, as aforesaid, to elect the first alternative, as hereinbefore provided: *And provided furthermore, and it is hereby enacted, That, upon the adoption of either alternative, a capital equal to ten per centum, at the least, on the gross amount of each loan, shall be made from any unappropriated money in the Treasury, and the*

same shall be invested in some safe and productive stock, as aforesaid; and the interest, dividends, or profits, arising therefrom, shall be reinvested, as aforesaid, for the eventual redemption of each of the said loans, to be negotiated as aforesaid.

SEC. 3. *And be it enacted*, That any act or acts, repugnant to, or inconsistent herewith, be, and the same are hereby, repealed.

We hereby certify the foregoing to be a true copy from the original act, which passed both branches of the Legislature of Maryland at their December session, eighteen hundred and twenty-seven.

Given under our hands, at the city of Annapolis. this third day of March, eighteen hundred and twenty-eight.

WILLIAM H. MARRIOTT,
President of the Senate of Maryland.

J. G. CHAPMAN,
Speaker of the House of Delegates.



CHESAPEAKE AND OHIO CANAL.

FEBRUARY 11, 1828.

Read, and referred to the Committee of the Whole House to which is committed the "Bill to amend and explain an act, entitled, 'An act confirming an act of the Legislature of Virginia, incorporating the Chesapeake and Ohio Canal Company, and an act of the State of Maryland for the same purpose.'"

Mr. MERCER, from the Committee on Roads and Canals, submitted the following report, supplementary to that of the 22d of January last, on the memorial of the Central Committee of the Chesapeake and Ohio Canal Convention:

The Committee on Roads and Canals deem it their duty to add, to the Report already submitted to the House of Representatives, upon the memorial of the Central Committee of the Chesapeake and Ohio Canal Convention, such information as they have subsequently received, respecting the probable cost of that work.

The most important of the facts, which they have to present to the House, are derived from sources of intelligence on which they can confidently rely: being supplied by the report of an actual examination, by one of their body, of the various works recently executed on the Eastern and Western sections of the Pennsylvania State Canal leading, from the mouth of Swetara Creek, on the Susquehannah, towards the head of the Juniata, and from Pittsburgh, up the Allegany, the Kiskiminitas and the Conemaugh, towards the Laurel Hill: a work more extended in length than the contemplated Chesapeake and Ohio Canal, and very closely resembling it in all its circumstances.

A cursory view of the map of the adjacent States of Pennsylvania, Maryland, and Virginia, demonstrates that the rivers Susquehannah and Juniata, regarded as one continued line of inland navigation, extending, from the Chesapeake Bay, to the base of the Allegany, are nearly parallel to the portion of the river Potomac, between its tide and the point on its North Branch, to which has been traced a route for the Eastern section of the Chesapeake and Ohio Canal. These lines are, in truth, no where more remote from each other, on a direct line, than eighty miles. They intersect, it is well known, the same ranges of mountains, and traverse a country remarkable, throughout, for the identity of its geological formation, at corresponding distances from the tide of the Atlantic. Its soil, its minerals, and its fossils, are the same. The Susquehannah is, indeed, a much broader river than the Potomac, and its waters do not rise as high, after the vernal or autumnal rains, as those of the Potomac: but the currents of both rivers are occasionally bordered by rich alluvial bottoms, of easy excavation, and are alike, here and there, for miles together, hemmed in by rocky and

precipitous shores. While the Potomac Canal will, in a single place, and for a short distance, displace a turnpike road, that of the Susquehanna and Juniata will do so in several places, and for miles together. Both these lines of artificial navigation will be imperfectly supplied, to the east of the Allegany, with building stone suited to the construction of locks: both are now found to be abundantly supplied with hydraulic, as well as common lime, of easy access. In relation to their western sections, both will be supplied with abundant materials, of the best quality, in the most convenient situations, and no difficulties of any sort will be encountered on the Monongahela and Youghiogeny, which have not been felt and surmounted on the Allegany, the Kiskiminitas, and the Conemaugh. The canal last in execution will have, moreover, the benefit of all the knowledge which experience has supplied, almost in its neighborhood; since the waters of both canals will be mingled at Pittsburg, their common point of union, on their way to Lake Erie. The importance of this last advantage may be well conceived, from the very remarkable fact, disclosed in the past year, that while the employment, at the same moment, of six thousand hands, upon the Western branch of the Pennsylvania Canal, has caused a considerable rise of the wages of common labor, the cost of the Canal has, in almost as great a proportion, actually declined. This last result will be perceived on an examination of the subjoined tables of the *lettings* of July and October last, on the Kiskiminitas and the Conemaugh, compared with the estimates of the Engineer, and the prior contracts for the Allegany Canal next to Pittsburgh.

Some experience has also been acquired of the probable cost of tunnelling in America, from the progress of the Pennsylvania Canals. One tunnel has recently been completed on the line of the Union Canal of Pennsylvania, which connects the Susquehanna and the Schuylkill; and two others, on the Western branch of her State Canal, have been, within the last year, put under contract, and partly executed. The last of those contracts, made at Blairsville, in October, is designed merely to save a distance of two and a quarter miles. It cuts off a circuit around a very rocky peninsula on the Conemaugh, by a subterranean canal, through solid rock, 750 feet in length, under a hill, 300 feet high, at the expense of \$13,000. (See App. No. 1.) The contractors are the same individuals, who, after completing the Lebanon tunnel, entered upon the construction of a second, 800 feet long, through Grant's Hill, in the town of Pittsburgh.

It is also a fact, of no small importance, that it has been found unnecessary to line, with masonry, the tunnel at Lebanon through slate rock. Nor is it expected to be at all necessary to line that on the Conemaugh, or the Allegany. (See App. No. 2.) The cost of the materials and masonry for that of the Chesapeake and Ohio Canal, supposed, also, to be conducted through sand rock or *slate-stone*, exclusive of the lining of the working shafts, is estimated, by the United States Engineers, at no less than 2,200,000 of 3,278,000 dollars, the computed cost of the entire tunnel of four miles and eighty yards. The cost of the Conemaugh tunnel is computed at one dollar the excavated cubic yard, including every possible charge.

If the elements of a just calculation be derived from the annexed tables of ascertained facts, and a fair comparison be instituted, between the simple deductions inferable from them, and the scientific conclusions of the United States' Engineers, the result of that comparison must be, that those learned officers have overrated the cost of the Chesapeake and Ohio Canal, in the aggregate, much more than one hundred per cent. ; and that this work can be accomplished on a more enlarged scale than their own, at less than ten millions of dollars. (See App. No. 3.) This favorable result may be reached without questioning that the really scientific part of their labor has been correctly performed; or, in other terms, that the quantities of the several species of work to which they have applied their estimates, have been truly ascertained.

It is a fact, the committee are assured, that excavation of the loosest soil, which they have never charged at less than 14 cents the cubic yard, has been carried to the depth of more than ten feet, for the length of an entire section of the canal, on the bottoms of the Alleghany river, by a sub-contractor, for five cents the cubic yard, by the simple use of the plough and scraper, with the labor of a man and boy, and a single pair of horses, unaided by a spade or mattock ; that earth excavation has averaged but seven cents and one mill, per cubic yard, and rock less than forty cents, while the computation of the latter, by the United States' Engineers, is never less than a dollar per cubic yard, and, in some cases, greatly exceeds that sum. The exterior dry walling, on the whole line of the Pennsylvania Canals, does not average 65 cents the cubic yard. On the Western line, the average is 52½ cents ; while, in the estimate of the United States' Engineers, it is computed at more than four times that cost, and, in heavy perpendicular walls, at as much as four dollars. The stone masonry upon the aqueducts of the Eastern section of the Pennsylvania Canals, where the stone is tolerably convenient, neatly dressed or hammered, and laid in parallel ranges, never exceeds, in cost, three dollars the perch, and on the culverts of the Western Canal, two dollars fifty cents ; while, in the estimate above mentioned, it is rated at five dollars eighty-one cents. That the lockage on the Western section of the Pennsylvania Canal has been well and completely executed, and grouted with hydraulic cement, for less than \$600 the foot lift ; while that of the Chesapeake and Ohio Canal, but very little exceeding it, in quantity of materials and labor, has been computed throughout its whole extent, at \$ 1500. Water line has cost, on the Western section of the Pennsylvania Canal, 25 cents the bushel, delivered at each lock : it is estimated by the U. States' Engineers at one dollar thirty cents, the bushel, on the whole line of canal.

But the committee especially invite the attention of the House to the report recently received from Messrs. James Geddes, and Nathan S. Roberts, two civil Engineers of great practical knowledge, acquired in superintending the construction of the canals of New York, and, subsequently, in the service of the State of Pennsylvania, upon the very canals, between the cost of which, and of the proposed canal,

from Georgetown to Pittsburg, a comparison is here instituted. (See App. No. 3.)

The disagreement between the estimates of the Chesapeake and Ohio Canal Convention and those of the United States' Engineers, caused an application to be made to the President of the United States, by several Members of the House of Representatives, at the close of the last session of Congress, to submit both, to the final judgment of an impartial and competent umpire, on which the public could confidently rely; to be derived from the long-tryed experience of two practical civil engineers of unquestioned skill and established reputation. (See App. No. 3.)

Accordingly, Messrs. Geddes and Roberts were invited to engage in an actual survey and estimate of the Chesapeake and Ohio Canal, which they have since conducted under a deep sense of the delicacy and importance of the trust reposed in them; and closed, so far as regards the Eastern Section of the Canal with an estimate of 3,639,813 dollars, exclusive of contingencies, for a canal of 186 miles, of the same size, in all respects, with the Erie Canal of New York; of 3,937,718 dollars, for a canal of the enlarged dimensions proposed by the United States' Engineers, and by them computed at 8,177,000 dollars; and of 4,071,744 dollars, for a canal five feet in depth throughout, and, at the surface of the water, wherever easy excavation only is to be encountered, sixty feet in width, with a proportional breadth at bottom; being the dimensions recommended in the report of the Committee on Roads and Canals, to the last House of Representatives. (See App. No. 3.)

A detailed estimate, of three of the subdivisions comprehended in the report of Messrs. Geddes and Roberts, will serve to illustrate the principles on which their entire computation is founded; and the last table of the appendix will be found to extend, through each subdivision of this section, a comparison of the estimate of these engineers with that presented by the long anterior report of the United States' Board of Internal Improvement. (See App. No. 3.)

The annexed correspondence, between the Chairman of the Committee and a gentleman engaged in an extensive work near Shepherdstown, in Virginia, discloses the existence of inexhaustible quantities of hydraulic lime on the Potomac; while its recent discovery, in corresponding situations on the Susquehanna and the James River, confirms the conclusions of the Committee in their former report, that it will be found on every long line of canal leading from the seaboard towards the mountains, through the limestone region of the Middle States of the Union.

On the Western Section of the Pennsylvania Canal, it has been delivered, wherever required, in a state fitted for immediate use, at 25 cents the bushel; and, being more easily quarried than common limestone, and requiring much less fuel to prepare it for grinding, than is consumed in calcining the latter, its cost, on the margin of the Potomac, will not greatly, if at all, exceed the price of common lime. If it has been hitherto as high as 45 cents the bushel on the Susquehan-

nah, it has been owing, simply, to the absence of the machine for grinding it which is employed so successfully on the Alleghany river.

When the Eastern section of the Canal shall be completed, this recently discovered treasure, for such it should be regarded, will swell the items which contribute to its revenue, and add another to the many public benefits which it is calculated to dispense. (See App. No. 4.)

The Committee did not design, in this supplemental report, to present to the House any other facts, than those, which might serve to correct the widely diffused prejudices against the Chesapeake and Ohio Canal, which have resulted from an erroneous estimate of its probable cost. But, as their former report treated, also, of the resources relied upon for the construction of this great national work, and of the profit to be expected from its stock, they have deemed it appropriate to insert, among the facts in the appendix, a list of the several private subscriptions, on the books opened within the District of Columbia, where they exceed a certain amount, as well as the aggregate sum of the whole. (See App. No. 6.) These, with about one hundred and twenty thousand dollars, subscribed in the distant towns and villages, the conditional subscription of half a million by the State of Maryland, and one and a half millions subscribed by the District Corporations, swell the total subscription, received to this period, to two millions six hundred thousand dollars, or to two-thirds of the computed cost of the Eastern section of a canal of the dimensions of the canals of New York. Of this sum, an amount of seven hundred and fifty thousand dollars rests, however, on a condition, which it remains with Congress to supply or withhold, by granting or refusing a subscription of ten thousand shares to the stock of the canal. With this sum, the entire cost will be supplied, it cannot be doubted, of that portion of the canal, connecting the District of Columbia with the present National Road, and the extensive coal banks at the base of the Allegany. That such a subscription, by the United States, will, moreover, ensure, at no distant day, the completion of the entire canal, is rendered more probable by the daily increasing interest which is every where felt in works of internal improvement; by the constantly augmenting profit of that great enterprize which has quickened into existence so many others of a similar nature; and by the gradually declining rate of interest upon every species of stock in the money markets of Europe and America.

The receipts of the Erie Canal of New York, keeping pace with the most sanguine hopes of its friends, have risen, in the last year, from \$687,976 46 to \$786,224 64 cents, or near one hundred thousand dollars. (See App. No. 5.)

If the subjects, which supply this growing revenue, were of the same description during the past, as in the antecedent year, then, since the recent discovery of hydraulic lime, on the banks of the Potomac, there remains but a single commodity, viz. gypsum, of the many which float on the Erie Canal of New York, which the Chesapeake and Ohio Canal may not be expected to yield in equal or greater abundance; and to these, chiefly the production of the *forests* and the *fields* of New

York, will be added, on the latter, inexhaustible supplies of mineral coal and iron, the fruitful sources of profit on the most productive canals of England and Scotland.

A valuable disclosure is derived from the inventive genius of that enterprising State. At very little additional cost, a structure has been given to the gates of the canal locks, which reduces, one-half, the time of passing each lock, and is, therefore, equivalent to doubling the entire locks of the Canal. (See Appendix, page 46.) This improvement removes, at once, a full moiety of the argument against the heavy lockage the Chesapeake and Ohio Canal; and, added to the progress which the experience of a single year has made, in ascertaining the cost of tunnelling in the United States, must totally dissipate every remaining prejudice against a work, which has only to be clearly comprehended, in order to be regarded in its plan and execution, as simple and as easy as, in its extent, it is grand; in its character, national; and in its end, beneficent.

APPENDIX.

No. 1.

The following extract of a letter from Alonzo Livermore, Engineer, of the 10th of December, 1827, to A. Lacock, Esq. shows that this contract is in a train of execution. "The contractors upon the last letting have mostly commenced operations. A great proportion of the grubbing has been done on the different contracts. The contractors of the tunnel have commenced work; they have excavated to the solid rock upon each end. Their present prospects are highly favorable."

"It can almost be calculated, to a certainty, that the canal will be completed, to Blairsville, by November, 1828. For this season, in the space of four months, although the weather has proved uncommonly unfavorable for canal operations, considerably more than half of the work has been done upon the line first put under contract."

No. 2.

Extract from a communication of Nathan S. Roberts, Engineer of the Western section of the Pennsylvania Canal, dated May 1st, 1827; containing an estimate of the Grant's Hill Tunnel.

"Tunnel, 800 feet, equal to 20 feet diameter, through indurated clay and layers of rock, at 25 dollars per foot lineal, \$20,000.

Note.—As the hill appears to be composed of alternate layers of earth and rock, it is highly probable it must be arched with cut stone masonry: supposing the inside to be 18 feet in the clear, and the arch 18 inches, 2,981.48 perches, at \$4 the perch, including centreing, \$11,925 92 cents."

Extract from A. Lacock's communication, to the Board of Canal Commissioners, dated Canal Office, Dec. 15, 1827.

"The contractors of this work have nearly completed the excavation of earth from the Allegany river to the north end of the tunnel: and a like progress has been made, upon the Monongahela river, to the south end. From the appearance and nature of the rock at the ends of the tunnel, it is believed it will be found sufficiently solid, and an arch of stone or brick, to sustain the line of the tunnel may be dispensed with. This will release the contractors from a heavy expense, and tend very much to facilitate their operations."

No. 3.

Report of Messrs. Geddes and Roberts.

The last session of Congress having expired without any decision upon the bills reported, from the Committee on Roads and Canals, to the House of Representatives, the following letter was addressed to the President of the United States, by the members whose names are subscribed to it :

HOUSE OF REPRESENTATIVES,

March 3d, 1827.

To the President of the United States :

SIR : The undersigned Members of Congress respectfully request that, in the interval between the expiration of the present and the commencement of the ensuing session of Congress, the estimates supplied by the United States' Board of Internal Improvement, and the late Ohio and Chesapeake Canal Convention, relative to the probable cost of that canal, may be submitted to such practical civil engineers as have long been professionally engaged in the actual construction of the various canals of the several States, with a view to reconcile the apparent disagreements between the results of those estimates, and to verify their accuracy, both in principle and detail.

In the execution of the purpose to which the undersigned earnestly ask your earliest attention, they beg leave to refer you to Canvass White and Daniel Wright, Esquires, late of New York, who are now, respectively, engaged in the service of the State of Pennsylvania, and of the Delaware and Chesapeake Canal Company.

As, in the performance of the trust devolved on them, the engineers who may be deputed to make the above estimates will have to pass over the route recommended for the Chesapeake and Ohio Canal, the undersigned further request, that they may be instructed to inquire into, and to report, the condition, situation, and quantity, of any beds of iron ore or coal, to be found upon, or near to, the line of the propos-

ed canal ; and of any other metals or minerals, in the vicinity thereof, the produce of which can be conveniently brought to the canal.

We have the honor to be,

With great respect,

Your obedient servants,

<i>J. Sloane,</i>	<i>P. Adams,</i>
<i>J. C. Wright,</i>	<i>Saml. P. Carson,</i>
<i>Elisha Whittlesey,</i>	<i>Geo. McDuffie,</i>
<i>J. Lawrence,</i>	<i>W. Haile,</i>
<i>C. F. Mercer,</i>	<i>J. C. Mitchell.</i>
<i>John Woods,</i>	<i>B. Estill,</i>
<i>Joseph Vance,</i>	<i>Charles Humphrey,</i>
<i>M. Bartley,</i>	<i>J. C. Isacks,</i>
<i>G. E. Mitchell,</i>	<i>John C. Weems,</i>
<i>D. Trimble,</i>	<i>Jos. Clark,</i>
<i>C. Forward,</i>	<i>Dudley Marvin,</i>
<i>Charles Miner,</i>	<i>Jno. Barney,</i>
<i>C. Dorsey,</i>	<i>Thos. Metcalfe,</i>
<i>Tho. Newton,</i>	<i>Wm. Armstrong,</i>
<i>Alfred H. Powell,</i>	<i>D. G. Garnsey,</i>
<i>James Strong,</i>	<i>D. Hugunin, jun.</i>

The request contained in this letter was readily accorded ; and Messrs. Wright and White being found to have contracted prior engagements for the approaching season, on the recommendation of the former, and by the advice of others, the invitation given to them was addressed to James Geddes and Nathan S. Roberts, two skillful engineers of New York ; the former having recently left the service of Pennsylvania, and the latter being the Chief Engineer on the Western Canal of that State ; from whom, was received, by the committee, through the Department of War, as early as the 10th day of January last, a detailed report of their survey and estimate of the first, fourth, and seventh subdivisions of the Eastern Section of the Chesapeake and Ohio Canal ; and on the 8th of the present month, through the same channel, the result of their survey and estimate of the eleven subdivisions, being the entire Eastern Section, comprehending near 186 miles of the canal next above Georgetown.

The detailed estimate of the 51½ miles, embraced by the three subdivisions first reported, is annexed in the form of the report ; and the general result of the estimates of the several subdivisions of the section is subjoined in a table, embracing, also, the estimate formed by the United States' Engineers of the cost of each of the same subdivisions.

WAR DEPARTMENT,

Washington City, Jan. 10th, 1828.

SIR: I have the honor to transmit, herewith, a report of the Chief Engineer, of this date, accompanied by the partial report and esti-

mate of Messrs. Geddes and Roberts, Civil Engineers, who were appointed to re-examine the route of the Chesapeake and Ohio Canal, and to report on the expense of constructing the same, in compliance with the request contained in your letter of the 7th instant.

I have the honor to be,

Very respectfully,

Your obedient servant,

JAMES BARBOUR.

HON. C. F. MERCER,

Chairman Committee on Roads and Canals.

ENGINEER DEPARTMENT,

Washington City, Jan. 10th, 1828.

SIR: In compliance with the request of the Chairman of the Committee on Roads and Canals, and by your direction, I have the honor to transmit, herewith, the partial report and estimate of Messrs. Geddes and Roberts, Civil Engineers, who were appointed to re-examine the route of the contemplated Chesapeake and Ohio Canal, and to make estimates of the expense of constructing the same.

I have the honor to be,

Very respectfully,

Your obedient servant,

A. MACOMB,

Maj. Gen. Chief Engineer.

HON. JAMES BARBOUR,

Secretary of War.

The following estimates per mile on the first, fourth, and seventh subdivisions of the Eastern section of the proposed Chesapeake and Ohio Canal, are for excavation, embankment, paving, or protecting walks in the river, aqueducts, culverts, bridges, dams, &c. and for feeders and locks; to which is added, for each subdivision, the cost of fences and waste weirs.

1st Mile on 1st Subdivision.

Yds. Cub.Yd. per Yd.

Amount.

325 × 60.66	Embankment	19,714 c. y. at 25 cts.	\$4,928
350 × 50	ditto	17,500 c. y. at 15 cts.	2,625
60 × 180	ditto	10,800 c. y. at 12½ cts.	1,350
533 × 30	ditto	15,990 c. y. at 10 cts.	1,599
492 × 13	ditto	6,396 c. y. at 9 cts.	576
	Grubbing	- - -	400
	One culvert	- - -	300
	Two bridges	- - -	300

———— \$ 12,078 +

Yds. Cub. Yd. per Yd.

Amount.

2d Mile.

33 x 130	Embankment	4,290 c. y.	
33 x 200	ditto	6,600	
42 x 180	ditto	7,560	
15 x 120	ditto	1,800	
<hr/>			
		20,250 c. y. at 12½ cts.	\$2,531
263 x 60	Excavation	15,780	} c. y. at 9 cts. 2,162
330 x 25	ditto	8,250	
1,044 x 13	ditto	13,572	
			c. y. at 8 cts. 1,086
	One culvert	-	300
	Grubbing	-	200
	Bridge	-	150

\$6,429—

3d Mile + 303 Fds.

70 x 439	Excavation	30,730	
10 x 130	ditto	1,300	
7 x 82	ditto	574	
<hr/>			
		32,604 c. y. at 14 cts.	4,565
17 x 222	Evitt's creek		
	embankment	3,774	
147 x 439	ditto	64,533	
43 x 558	ditto	23,994	
220 x 667	ditto	146,740	
142 x 150	ditto	21,300	
88 x 50	ditto	4,400	
<hr/>			
		264,741 c. y. at 18 cts.	47,653
92 x 37	Excavation	3,404	
75 x 56	ditto	4,200	
100 x 71	ditto	7,100	
100 x 81	ditto	8,100	
166 x 71	ditto	11,786	
75 x 43	ditto	3,225	

		37,815 c. y. at 25 cts.	9,454
711 x 20	ditto	14,220 c. y. at 9 cts.	1,280
	Evitt's creek aqueduct, creek	-	2,730
	Culvert 150 feet	-	450

66,131 + *

4th Mile—303 Fds.

67 x 86	Embankment	5,762 c. y. at 11 cts.	634
1,390 x 14	Excavation	19,460 c. y. at 9 cts.	1,751
	Grubbing	-	50
	Farm bridge	-	150
	One culvert	-	350
	Moving the road	-	200

3,135 +

* By the signs of + and — the Engineers design to denote the addition or subtraction of less than 50 cents.

Yds. Cub.Yd. per Yd.		5th Mile.		Amount.
33 x 160	Embankment	5,280		
67 x 200	ditto	13,400		
16 x 75	ditto	1,200		
17 x 85	ditto	1,445		
		<hr/>		
		21,325 c. y. at 12½ cts.	\$2,666	
1,627 x 16	Excavation	26,032 c. y. at 9 cts.	2,343	
	Grubbing	- - -	150	
	Farm bridge	- - -	150	
	Three culverts	- - -	1,050	
		<hr/>		
		6th Mile.		
67 x 35	Deep cutting excavation	2,345		
66 x 102	ditto	6,732		
83 x 168	ditto	13,944		
111 x 111	ditto	12,321		
133 x 30	ditto	3,990		
		<hr/>		
		39,332 c. y. at 20 cts.	7,866	
1,300 x 15	Excavation	19 500 c. y. at 9 cts.	1,755	
	Grubbing, whole distance	- - -	400	
	One bridge	- - -	175	
	*Lockage 40 feet at \$800 per ft		32,000	
		<hr/>		
		42,196—		
		<hr/>		
		7th Mile.		
1,133 x 32	Embankment	36,256 c. y. at 20 cts.	7,251	
	Paving c. y.	5,665 yds. at 75 cts.	4,249	
627 x 16	Excavation	10,032 c. y. at 10 cts.	1,003	
	Grubbing	- - -	150	
	Making road	- - -	1,133	
	Lockage 24 ft. at \$800 per foot		19,200	
		<hr/>		
		32,986+		
		<hr/>		
		8th Mile.		
283 x 20	Embankment	5 660 c. y. at 10 cts.	566	
	Paving c. y.	1,415 do 75 cts.	1,061	
133 x 45	Embankment	5,985 do 10 cts.	598	
1,344 x 13	Excavation	17,472 do 8 cts.	1,398	
	Two culverts	- - -	700	
	1 farm bridge	- - -	150	
	Lockage 8 ft. at \$800 per foot		6,400	
		<hr/>		
		10,874—		

* As in all the *lime districts* through Pennsylvania and New York, in which canals have been made, whether on the east or west side of the Alleghenies, that calcareous mineral, used in the making of *water cement*, has been discovered; it is highly probable that it exists on the Potomac, and the above calculations are made on the supposition that it will there be found.

Yds. Cub. Yd. per Yd.

Amount.

9th Mile.

210 x 25	Embankment	5,250 c. y. at 20 cts.	\$1,050
	Paving	1,050 do 75 cts.	787
16 x 55	Embankment	880 c. y.	
1,534 x 15	Excavation	23,010 c. y.	

 23,890 c. y. at 8 cts 1,911

Two culverts - - - 600

 \$4,349—
10th Mile+280 yds.

333 x 28	Embankment	9,324 c. y. at 12½ cts.	1,165
	Paving	1,332 do 90 cts.	1,199
712 x 33	Stone bottom	23,496 do 50 cts.	11,748
712 x 74	Embankment	52,688 do 18 cts.	9,484
	Paving	4,984 do 90 cts.	4,486
150 x 45	Embankment	6,750 do 10 cts.	675
845 x 14	Excavation	11,830 do 8 cts.	946
	Grubbing	- - -	200
	One culvert	- - -	350
	Farm bridge	- - -	150
	Lockage 8 ft. at \$800 per foot	-	6,400

 36,803 x
11th Mile—280 yds.

800 x 32	Embankment	25,600 c. y. at 10 cts.	2,560
	Paving	4,000 c. y. at \$1	4,000
16 x 45	Embankment	720	
664 x 20	Excavation	13,380	

 14,100 c. y. at 8 cts. 1,128

Two culverts - - - 600

Farm bridge - - - 150

 8,438—
12th Mile.

33 x 45	Embankment	1,485 c. y. at 10 cts.	148
250 x 30	Excavation	7,500	
1,477 x 13	ditto	19,201	

 26,701 c. y. at 8 cts. 2,136

Three culverts - - - 1,000

 3,285—
13th Mile.

100 x 50	Embankment	5,000	
1,660 x 13	Excavation	21,580	

 26,580 c. y. at 8 cts. 2,126

Yds. Cub. Yd. per Yd.

Amount.

Three culverts	-	-	-	\$ 900
Farm bridge	-	-	-	150

 \$ 3,176 +

14th Mile.

158 x 146	Embankment	23,068
217 x 98	ditto	21,266

 44,334 c. y. at 20 cts. 8,866

Paving 3,375 c. y. at \$1 3,375

Embankment 4,500 c. y. at 10 cts. 450

100 x 45	Excavation	17,990	do	9 cts.	1,619
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Grubbing - - - 100

Two culverts - - - 700

One bridge - - - 150

One lock 8 feet at \$800 per foot 6,400

 21,661—

15th Mile.

1,026 x 50	Embankment	51,300 c. y at 20 cts.	10,260
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Paving 10,260 c. y. at \$1 10,260

734 x 16	Excavation	11,744 c. y. at 8 cts.	939
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One culvert - - - 400

One bridge - - - 200

 22,060—

16th Mile.

416 x 36	Embankment	14,976
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67 x 155	ditto	10,385
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16 x 75	ditto	1,200
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17 x 50	ditto	850
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 27,411 c. y. at 12½ cts. 3,426

1,244' x 14	Excavation	17,416 c. y. at 8 cts.	1,393
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Three culverts \$800, 400, 300, 1,500

Farm bridge - - - 150

Lockage 8 feet at \$800 per foot - 6,400

 12,870—

Remainder of Subdivision No. 1. 1,692 yards.

450 x 110	Embankment	49,500 c. y. at 20 cts.	9,990
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Paving 4,050 do 75 cts. 3,037

1,242 x 14	Excavation	17,388 do	8 cts. 1,391
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Grubbing - - - 200

Road Bridge - - - 200

 14,729—

Dam below mouth of South branch	-	9,000
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Yds. Cub. Yd. per Yd.

Amount.

Beginning of 4th Subdivision.

Licking Creek aqueduct, of three
arches, 30 feet cord each, found-
ations in 2 feet water, estimate \$10,000

1st Mile on 4th Subdivision.

1,760 x 16	Excavation 28,160 c. y. at 8 cts.	2,253	
	Grubbing - - -	150	
	Two farm bridges - -	300	
			<hr/> \$ 12,703

2d Mile.

50 x 75	Embankment	3,750	
17 x 66	do	1,122	
200 x 60	Excavation	12,000	
1,493 x 16	do	23,888	
			<hr/>
	40,760 c. y. at 8 cts.	3,260	
	Two culverts - - -	600	
	Grubbing - - -	150	
	Farm bridge - - -	150	
			<hr/> 4,161—

3d Mile.

1,760 x 30	Excavation 52,800 c. y. at 8 cts.	4,224	
	Grubbing - - -	200	
	One culvert - - -	300	
	Farm bridge - - -	150	
			<hr/> 4,847—

4th Mile.

1,760 x 35	Excavation 61,600 c. y. at 8 cts.	4,928	
	Two culverts - - -	600	
	Two farm bridges - -	300	
			<hr/> 5,828

5th Mile.

1,760 x 25	Excavation 44,000 c. y. at 8 cts.	3,520	
	Two culverts - - -	600	
	One bridge - - -	150	
			<hr/> 4,270

6th Mile.

34 x 270	Embankment	9,180	
1,726 x 30	Excavation	51,780	
			<hr/>
	60,960 c. y. at 8 cts.	4,877	
	One culvert - - -	400	
	Two farm bridges - -	300	
			<hr/> 5,577—

Yds. Cub. Yd. per Yd.

Amount.

7th Mile.

50 x 349	Embankment	17,450		
83 x 95	do	7,885		
50 x 120	do	6,000		
<hr/>				
		31,335 c. y. at 12½ cts.	\$3,917	
20 x 11	Excavation, rock	220	do	60 132
440 x 32	do rocky	14,080	do	16 2,253
1,117 x 32	do	35,714	do	10 3,574
	Three culverts	-	-	1,500
	One road, and two farm bridges			500
<hr/>				\$11,876+

8th Mile.

83 x 24	Excavation	1,992		
100 x 65	do	6,500		
100 x 123	do	12,300		
187 x 210	do	32,270		
134 x 133	do	17,822		
134 x 82	do	10,988		
40 x 25	do	1,000		
<hr/>				
	rocky	89.872 c. y. at 40 cts.	\$35,948	
982 x 50	Excavation	49,100	do	16 7,856
	One culvert	-	-	300
	Two bridges	-	-	350
	Lockage 32 feet, at \$ 800 per foot			25,600
<hr/>				70,055—

9th Mile.

800 x 158	Embankment	126,400 c. y. at 35 c.	44,240	
	Paving	8,000	do	75 6,000
483 x 35	Embankment	16,905	do	20 3,381
	Paving	3,381	do	75 2,536
477 x 40	Excavation	19,080	do	12½ 2,385
	Two culverts	-	-	1,000
	Lockage, 8 feet, at \$ 800 per foot			6,400
<hr/>				65,942—

10th Mile.

967 x 160	Embankment	154,720 c. y. at 35 c.	54,152	
	Paving	10,637	do	75 7,978
793 x 64	Excavation	50,752	do	12½ 6,344
	One culvert	-	-	300
<hr/>				68,774—

11th Mile.

Yds. Cub. yd. per yd.			Amount.
1,760 x 30	Excavation 52,800 c. y. at 10 cts.	\$5.280	
	Culvert - - -	1,000	
	Road bridge - - -	200	
		<hr/>	\$6,480

12th Mile.

1,760 x 25	Excavation 44,000 c. y. at 10 cts.	-	4,400
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13th Mile.

1,760 x 14	Excavation 24,640 c. y. at 8 cts.	1,971	
	Culvert - - -	300	
	Farm bridge - - -	150	
		<hr/>	2,421 +

14th Mile.

1,227 x 180	Embankment 220,860 c. y. at 35 c.	77,301	
	Paving 17,178 do. at 75	12,884	
533 x 74	Embankment 39,442 do 20	7,883	
	Paving 6,396 do 75	4,797	
		<hr/>	102,870—

15th Mile.

433 x 180	Embankment 77,940 c. y. at 35 c.	27,279	
	Paving 6,062 do 75	4,546	
26 x 130	Embankment 3,380 do 10	338	
1,301 x 17	do 22,117 do 9	1,991	
	Culvert - - -	400	
	Farm bridge - - -	150	
		<hr/>	34,704 +

16th Mile.

1,760 x 15	Excavation 26,400 c. y. at 9 cts.	2,376	
	Road bridge - - -	200	
	Grubbing - - -	150	
		<hr/>	2,726

Remainder of Subdivision No. 4.

50 x 110	Embankment 5.500		
33 x 45	do 1,485		
		<hr/>	
	6,985 c. y. at 11 cts.	768	
200 x 130	Embankment 26,000 c. y. at 14 cts.	\$3,640	
1,246 x 14	Excavation 17,444 do 8	1,396	
	Two culverts - - -	700	
	One farm bridge - - -	150	
		<hr/>	\$6,654—

SUBDIVISION 7TH.

1st Mile on Subdivision 7th.

Yds. Cub. yd. per yd.				Amount.
833 x 54	Embankment	44,982 c. y. at 20 cts.	\$8,996	
	Paving	4,998 do 75	3,749	
927 x 14	Excavation	12,978 do 10	1,298	
	Making road	- - -	3,000	
	Farm bridge	- - -	150	
			<hr/>	\$17,193—

2d Mile.

66 x 35	Embankment	2,310 c. y. at 10 cts.	231	
1,694 x 14	Excavation	23,716 c. y. at 8 cts.	1,897	
	Two culverts	- - -	700	
	Three farm bridges	- - -	300	
	Lockage 8 ft. at \$ 800 per foot	-	6,400	
			<hr/>	9,528+

3d Mile.

17 x 45	Embankment	765		
1,743 x 14	Excavation	24,402		
		<hr/>		
		25,167 c. y. at 8 cts.	2,013	
	2 culverts	- - -	600	
	2 farm bridges	- - -	300	
			<hr/>	2,913+

4th Mile.

33 x 75	Embankment	2,475 c. y. at 10 cts.	247	
1,727 x 14	Excavation	24,178 c. y. at 8 cts.	1,935	
	Three culverts	- - -	1,000	
	Farm bridge	- - -	150	
	Grubbing	- - -	100	
			<hr/>	3,432—

5th Mile.

100 x 85	Embankment	8,500 c. y. at 10 cts.	850	
1,660 x 14	Excavation	23,240 do 9 cts.	2,092	
	Two culverts	- - -	600	
	Two bridges	- - -	400	
			<hr/>	3,942—

6th Mile.

33 x 85	Embankment	2,805 c. y. at 10 cts.	\$ 280	
1,727 x 14	Excavation	24,178 do 8 cts.	1,935	
	One culvert	- - -	300	
	Two farm bridges	- - -	300	
	Grubbing	- - -	200	
			<hr/>	\$ 3,015—

7th Mile.

Yds. cub yd. per yd.				Amount.
13 x 35	Embankment	1,105 c. y. at 10 cts	\$110	
1,747 x 14	Excavation	24,458 do 8 cts.	1,957	
	One culvert	- - -	400	
	One bridge	- - -	150	
	Lockage 8 ft. at \$ 800 per foot,		6,400	
				<u>\$9,017+</u>

8th Mile.

50 x 135	Embankment	6,750		
25 x 45	do	1,125		
		<u>7,875 c. y. at 10 cts.</u>	787	
1,685 x 14	Excavation	23,590 do 8	1,888	
	Two culverts	- - -	1,300	
	One bridge	- - -	150	
				<u>4,125—</u>

9th Mile.

58 x 108	Embankment	6,264		
20 x 85	do	1,700		
		<u>7,964 c. y. at 10 cts.</u>	876	
1,682 x 14	Excavation	23,548 do 9	2,119	
	Two culverts	- - -	2,300	
	One farm bridge	- - -	150	
				<u>5,445+</u>

10th Mile.

783 x 60	Embankment	46,980 c. y. at 18 cts.	8,456	
	Paving	5,481 do 75	4,111	
	Cutting rocky points	- - -	250	
977 x 20	Excavation	19,540 c. y. at 10 cts.	1,954	
	One culvert	- - -	400	
	One farm bridge	- - -	150	
	Lockage 8 ft. at \$ 800 per foot,		6,400	
				<u>21,721+</u>

11th Mile.

1,760 x 18	Excavation	31,680 c. y. at 9 cts.	2,851	
	Grubbing	- - -	100	
	One farm bridge	- - -	150	
				<u>3,101+</u>

12th Mile.

Yds. cub. yd. per yd.				Amount.
683 x 113	Embankment	77,179 c. y.	at 35 cts.	\$27.013
	Paving	6,830 do	75	5,122
1,077 x 15	Excavation	16,155 do	8	1,292
	Two culverts	-	-	600
	One farm bridge	-	-	150
	Rock cutting	150 c. y.	-	75
				<hr/> \$34,253—

13th Mile + 100 yards.

533 x 230	Embankment	122,590 c. y.	at 35 c.	42,907
	Paving	7,462 do	\$ 1	7,462
20 x 110	Embankment	2,900 do	10 cts.	290
1,307 x 14	Excavation	18,298 do	9	1,647
	One culvert	-	-	400
	One road bridge	-	-	200
				<hr/> 52,835+

14th Mile — 100 yards.

1,660 x 13	Excavation	21,580 c. y.	at 8 cts.	1,726
	One farm bridge	-	-	150
				<hr/> 1,876+

15th Mile.

50 x 45	Embankment	2,250		
1,710 x 13	Excavation	22,230		
		24,480 c. y.	at 7 cts.	1,714
	One culvert	-	-	300
	One farm bridge	-	-	150
				<hr/> 2,164—

16th Mile.

182 x 85	Embankment	15,470		
33 x 140	do	4,620		
33 x 85	do	2,805		
50 x 65	do	3,250		
23 x 55	do	1,265		
1,439 x 20	Excavation	28,780		
		56,190 c. y.	at 11 cts.	6,181
	For rock	-	-	150
	Five culverts	-	-	2,200
	One road bridge	-	-	200
				<hr/> 8,731—

17th Mile.

Yds. cub. yd. per yd.		Amount.	
367 x 50	Embankment	18,350	
300 x 40	do	12,000	
66 x 35	do	2,310	
16 x 45	do	720	
		<hr/>	
		33,380 c. y. at 11 cts.	\$3,672
1,011 x 15	Excavation	15,160	do 8 1,213
	Three culverts	-	- 900
	Two bridges	-	- 350
		<hr/>	
		\$6,135	
 <i>Remainder of Subdivision No. 7.</i> 			
123 x 95	Embankment	11,685	
10 x 270	do	2,700	
		<hr/>	
		14,385 c. y. at 11 cts.	1,582
1,013 x 20	Excavation	-	- 1,621
	One culvert	-	- 300
	One bridge	-	- 150
		<hr/>	
		2,653	

RECAPITULATION.

SUBDIVISION 1.

Excavation, &c.	-	-	-	-	\$ 307,559
Fencing	-	-	-	-	5,760
Waste weirs	-	-	-	-	1,120
Dam below South Branch	-	-	-	-	9,000
					<hr/>
					\$ 323,439—

SUBDIVISION 4.

Excavation, &c.	-	-	-	-	\$ 414,305
Fencing	-	-	-	-	6,720
Waste weirs	-	-	-	-	1,000
					<hr/>
					\$ 422,025—

SUBDIVISION 7.

Excavation, &c.	-	-	-	-	\$ 193,079
Fencing	-	-	-	-	7,680
Waste weirs	-	-	-	-	1,000
					<hr/>
					\$ 201,759—

The foregoing calculations being made on a canal of forty feet surface, four feet depth, and twenty feet bottom, with locks 90 feet

long, the following calculations show the sums to be added, for the cost of a canal made five feet deep, with locks one hundred and two feet long, on the three following subdivisions, with a width of surface of forty-eight feet, and serf beams, at the *water line* of two feet horizontally, at each side, on all the *feasible and easily executed parts* of said subdivisions; no part, being less than forty feet surface, and the depth five feet.

The feasible parts are as follow :

SUBDIVISION 1ST.		SUBDIVISION 4TH.		SUBDIVISION 7TH.	
Miles.	Yards.	Miles.	Yards.	Miles.	Yards.
1	-	1	1,760	1	927
2	1,563	2	1,493	2	1,694
3	-	3	-	3	1,743
4	933	4	-	4	1,727
5	667	5	-	5	1,660
6	600	6	-	6	1,727
7	-	7	-	7	1,747
8	1,267	8	-	8	1,685
9	1,534	9	-	9	1,682
10	845	10	-	10	
11	664	11	-	11	1,760
12	1,477	12	500	12	1,077
13	1,660	13	1,760	13	1,307
14	1,285	14	-	14	1,660
15	734	15	1,801	15	1,710
16	1,244	16	1,760	16	1,439
Remainder	1,242	Remainder	1,246	17	1,011
	15,715		9,820	Remainder	500
					25,056

Additions to be made to cover the cost of a Canal of 48 feet surface.

ON SUBDIVISION 1ST.

For excavation, &c. on 8 miles, 1,635 yards=15,715	
yards. at \$ 1 per yard	\$ 15,715
For culverts, at \$ 55 each	1,210
12 bridges, at \$ 50 each	600
96 feet of lockage, at \$ 80. per foot	7,680
To which add the cost of the canal of 40 feet	323,438
	<u>\$ 348,644—</u>

ON SUBDIVISION 4TH.

For excavation on 5 miles 1,020 yards, at \$ 1 per yard	-	\$ 9,820
culverts at \$ 55 each	- - -	770
19 bridges, at \$ 50 each	- - -	950
40 feet lockage, at \$ 80 per foot	- - -	3,200
To which add the cost of the canal of 40 feet surface	-	422 025
		<u><u>\$436,765—</u></u>

ON SUBDIVISION 7TH.

For excavation on 14 miles 416 yards, at \$ 1 per yard	\$ 25,056
25 culverts, at \$ 55 each	- 1,375
22 bridges, at \$ 50 each	- 1,100
24 feet of lockage, at \$ 80 per foot	- 1,920
To which add the cost of the canal of 40 feet surface	201,759
	<u><u>\$ 231,210—</u></u>

Further calculations, showing the additions to be made to the Canal of 40 feet surface, which shall cover the cost of making one of 60 feet surface, five feet deep, without serif beams.

On the aforesaid feasible parts of the following subdivisions, they are as follows :

SUBDIVISION 1ST.

On 8 miles 1,635 yards=15,715 yards for excavation, &c.	
at \$ 1 50 per yard	\$ 23,572
On 22 culverts, at \$ 94 each	- 2,068
12 bridges, at \$ 150 each	- 1,800
96 feet of lockage, at \$ 80 per foot	- 7,680
The cost of the 40 feet canal	- 323,438
	<u><u>\$ 358,558</u></u>

SUBDIVISION 4TH.

On 5 miles 1,020 yards=9,820 yards for excavation, &c.	
at \$ 1 50 per yard	\$ 14,730
11 culverts, at \$ 94 each	- 1,316
19 bridges, at \$ 150 each	- 2,850
40 feet of lockage, at \$ 80 per foot	- 3,200
The cost of the 40 feet canal	- 422,025
	<u><u>\$ 444,121</u></u>

SUBDIVISION 7TH.

On 14 miles 416 yards=25,056 yards for excavation, &c.

at \$ 1 50 per yard	-	-	-	-	\$ 37,584
25 culverts, at \$ 94 each	-	-	-	-	2,350
22 bridges, at \$ 150 each	-	-	-	-	3,300
24 feet of lockage, at \$ 80 per foot	-	-	-	-	1,920
The cost of the 40 feet canal	-	-	-	-	201,759
					<hr/>
					\$ 246 915
					<hr/>

SYNOPSIS OF THE ESTIMATES.

The above 3 subdivisions, measuring 55.5 miles, amount,
 in the 40 feet canal to - - - - \$ 947,223
 To which sum \$ 69,376 being added, makes the cost of the
 48 feet canal equal - - - - 1,016,619
 And when said sum has been added to \$ 102,370, it shows
 the cost of the 60 feet canal to be - - - - 1,049,593

The portion of the above 51.5 miles, occupying the Potomac flats, with other smooth surfaces, and running on the face of moderate slopes, are denominated above as "feasible," and amount to 28 miles 1,311 yards.

N. B. No calculation has been made for the purchase of land or water rights.

JAMES GEDDES,
 NATHAN S. ROBERTS.

It has been seen that, Messrs. Geddes and Roberts recommend, and experience confirms their decision, slope, in preference to perpendicular walls, where required to protect an embankment from abrasion by water, and compute their cost, where stone is convenient, at 75 cents the yard.

Rock excavation they compute at 50 cents: the lowest earth excavation at 8 cents the cubic yard, which includes the cost of the formation of the adjacent bank of the canal.

Their allowance for embankment varies, and, in one mile, reaches 35 cents the cubic yard, to the extent of more than 220,000 yards, rendering the cost of this mile of the canal, the 14th of the 4th subdivision, including other expenses, more than 102,000 dollars. The lockage, throughout, they compute at 800 dollars the foot lift; presuming that water lime, in abundance, will be found on the line of this canal, as it has been found on that of every other canal, of any considerable length, in the United States. Another mile, the 3d of the 1st subdivision, extended to one mile and 303 yards, they compute at 66,151 dollars.

The cheapest mile, the 15th of the 7th subdivision, which, like many others, admits of the lightest and easiest species of excavation, they reckon at 8 cents the cubic yard, throughout; and, allowing

18	20	45	50	25
16	20	40	46	10
25	14	53	60	275
12½	12½	38	40	45
20	16	35	36	25
25	16	40	40	20
20	16			20

of bringing Stone from a distance, for the Wall,

JAMES CLARKE, Superintendent.

* This enlargement, it is understood extends to 126 of the 186 miles.

SUBDIVISION 7TH.

On 14 miles 416 yards=25,056 yards for excavation, &c.

at \$ 1 50 per yard	-	-	-	-	\$ 37,584
25 culverts, at \$ 94 each	-	-	-	-	2,350
22 bridges, at \$ 150 each	-	-	-	-	3,300
24 feet of lockage, at \$ 80 per foot	-	-	-	-	1,920
The cost of the 40 feet canal	-	-	-	-	201,759
					<hr/> <hr/>
					\$ 246 913

SYNOPSIS OF THE ESTIMATES.

The above 3 subdivisions, measuring 55.5 miles, amount, in the 40 feet canal to - - - - \$ 947,223
 To which sum \$69,396 being added, makes the cost of the 48 feet canal equal - - - - 1,016,619
 And when said sum has been added to \$ 102,370, it shows the cost of the 60 feet canal to be - - - - 1,049,593

The portion of the above 51.5 miles, occupying the Patomac flats, with other smooth surfaces, and running on the face of moderate slopes, are denominated above as "feasible," and amount to 28 miles 1,311 yards.

N. B. No calculation has been made for the purchase of land or water rights.

JAMES GEDDES,
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It has been seen that, Messrs. Geddes and Roberts recommend, and experience confirms their decision, slope, in preference to perpendicular walls, where required to protect an embankment from abrasion by water, and compute their cost, where stone is convenient, at 75 cents the yard.

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The cheapest mile, the 15th of the 7th subdivision, which, like many others, admits of the lightest and easiest species of excavation, they reckon at 8 cents the cubic yard, throughout; and, allowing

A STATEMENT OF CONTRACTS for the Excavation of ninety-one Sections, on the Juniata Division of the Pennsylvania Canal.

No. of Section.	Names of Contractors.	Date of Contract.	Excavation.	Embankment.	Puddling.	Solid rock.	State rock.	Hard pan.	Vertical wall.	Outside slope.	Inside slope.	Grubbing and clearing.
									Per perch of 25 cubic feet.		Per sq. yard.	Dollars.
1	Daniel Vanslyke	Sept. 12, 1827	8 1/2	10	20	30	30	20	-	48	14	600
2	Consaul, Yates, and Magee	Nov. 23 do	10	11	25	30	30	25	50	50	13	300
3	do	do	9	12 1/2	30	30	30	25	50	50	13	150
4	Braumont & Co.	Nov. 9 do	8 1/2	13	18	35	24	20	45	55	12 1/2	200
5	do	do	8	14	18	38	20	20	50	58	do	100
6	James Thompson	Oct. 10 do	8	10	16	37	20	17	50	50	do	120
7	Burr & Herkimer	Aug. 29 do	12	10	27	45	25	30	45	40	13 1/2	200
8	Paul Provost & Co.	Oct. 10 do	10	14 1/2	17	49	24	25	47	47	do	320
9	Guy, Johnson & Co.	Nov. 17 do	12	14	30	45	25	17	50	60	13	300
10	John H. Pool & Co.	Sept. 12 do	9	13	30	48	30	38	50	50	do	400
11	do	do	9	13	30	48	30	38	50	50	do	400
12	Joseph M. Kesson & Co.	Oct. 10 do	13	14	18	38	25	18	40	40	do	200
13	do	do	11	13	18	38	25	18	40	40	do	150
14	Thomas & James Moore	Sept. 10 do	11	14	18	38	20	16	40	37 1/2	do	400
15	do	do	8	14	11	40	30	30	45	45	do	400
16	Vanslyke & Devault	do	10	17	18	40	30	30	45	45	do	400
17	McManus & Cox	Oct. 12 do	8	15	25	37 1/2	25	13	37 1/2	37 1/2	do	150
18	Spink & Wellman	Sept. 10 do	9	15	25	40	18	14	40	60	12 1/2	150
19	John & Charles Murray	Nov. 15 do	11	14	18	46	28	19	45	45	do	110
20	Connally & Scott	Oct. 10 do	10	15	16	45	25	19	45	45	do	55
21	Michael Buck	Nov. 13 do	10	15	16	45	25	19	45	45	do	55
22	Henry & Edwin	Oct. 10 do	9	12 1/2	25	40	25	18	49	50	12	20
23	Michael Holman	Sept. 12 do	8	20	16	50	25	15 1/2	50	50	12 1/2	30
24	David Lusk	Oct. 1 do	7	11 1/2	20	30	38	23	80	87 1/2	do	50
25	Spink & Wellman	Sept. 12 do	7	11 1/2	16	37	25	14	49	55	14	62
26	Holman & Lyles	Oct. 15 do	8	14	12 1/2	46	32	14	40	45	12 1/2	15
27	William Steenburg	Sept. 1 do	9	13 1/2	18	45	28	18	40	45	38	do
28	do	do	10	14	18 1/2	45	18	15	62 1/2	75	16	150
29	Turner & Osborne	Nov. 23 do	10	15	15	50	25	15	50	50	13 1/2	200
30	Anderson & Groves	Sept. 15 do	10	14	16	40 1/2	35	14	55	55	14	103
31	Rugh Speer	do	7 1/2	10	13	30	20	14	55	55	14	12
32	Isaac & Samuel Thompson	Oct. 10 do	7 1/2	14	10	50	20	20	47	50	do	75
33	Christopher Marks	Sept. 3 do	7 1/2	10 1/2	16	45	20	15	40	65	15	20
34	Smith & Gaumn	Oct. 10 do	7 1/2	14	14	45	20	15	40	65	15	20
35	Christopher Marks	Oct. 10 do	7 1/2	14	14	45	20	15	40	65	15	20
36	McNae & O'Friel	do	10	13	15	53	35	18	45	48 1/2	15	195
37*	William & Gerward	Nov. 23 do	10	14	17	45	25	15	40	50	30	12 1/2
38	Seaburg Parsons	Oct. 17 do	7 1/2	13	14	37 1/2	25	16	45	45	12 1/2	30
39	Guy, Johnson & Co.	Nov. 17 do	8	13 1/2	13 1/2	37 1/2	30	15	40	50	30	12 1/2
40	Guy, Johnson & Co.	Nov. 17 do	8	13 1/2	13 1/2	37 1/2	30	15	40	50	30	12 1/2
41	J. M. & R. M. Johnson	Sept. 12 do	9	12	20	49	25	15	40	50	30	12 1/2
42	Kerr & Waller	Nov. 5 do	11	14	20	45	30	25	50	56 1/2	12 1/2	55
43	Stockpole & Stiles	Sept. 12 do	7	10	25	40	18	18	41	40	do	25
44	William Steenburg	1 do	8 1/2	10	11	25	16	20	45	50	do	10
45	Milliken & Brothers	1 do	12	10	20	37 1/2	25	20	40	46	do	275
46	do	do	12	10	20	37 1/2	25	20	40	46	do	275
47	Atken & Mathers	1 do	7 1/2	12 1/2	15	35	18	13 1/2	45	60	do	45
48	Ross & Allen	1 do	7 1/2	12 1/2	15	35	18	13 1/2	45	60	do	45
49	David Brought	Nov. 12 do	8 1/2	15	14	31	25	16	35	36	12 1/2	30
50	Guy, Johnson, & Co.	Nov. 17 do	9	12 1/2	16	50	20	16	40	40	do	50
51	Consaul, Yates, & Magee	Sept. 10 do	7 1/2	12	12 1/2	45	19	20	37 1/2	37 1/2	12 1/2	85
52	Evan & Smith	Nov. 20 do	9	15	18	45	25	16	46	50	do	200
53*	Patrick Brown	Nov. 20 do	9	15	18	45	25	16	46	50	do	200
54*	Beaumont & Co.	Nov. 20 do	9	15	18	45	25	16	46	50	do	200
55	Casper Dull	Oct. 10 do	8	11	17	40	20	25	40	50	do	50
56	Charles O'Donnell & Son	Oct. 10 do	9 1/2	14	18	43	21 1/2	16	50	50	do	80
57	Schubert, Stoughton, & Co.	Nov. 23 do	9 1/2	15	16	45	25	16	45	48	40	160
58	Pettit & Richter	do	9 1/2	15	16	45	25	16	45	48	40	160
59	Schubert, Stoughton, & Co.	Oct. 13 do	9 1/2	15	16	45	25	16	45	48	40	160
60	James G. Wagner	Oct. 13 do	8 1/2	10	25	37 1/2	20	15 1/2	40	45 1/2	40	15
61	Guy, Johnson & Co.	Nov. 10 do	8	15	14	40	20	12	40	37 1/2	15	50
62	Guy, Johnson & Co.	Nov. 10 do	8	15	14	40	20	12	40	37 1/2	15	50
63	Schubert, Stoughton, & Co.	Nov. 17 do	10	18	15	45	25	16	70	75	40	12 1/2
64	do	do	10	18	15	45	25	16	70	75	40	12 1/2
65	Brault & Cox	Oct. 15 do	9 1/2	15	15	45	25	16	70	75	40	245
66	Shuman & Cummins	Oct. 15 do	9 1/2	15	15	45	25	16	70	75	40	245
67	Atkin & Mathers	Oct. 15 do	8 1/2	12	13 1/2	48	25	19	62 1/2	62 1/2	do	350
68	Milliken & Brothers	1 do	8	12	13 1/2	48	25	19	62 1/2	62 1/2	do	350
69	E. Rosseman	Sept. 15 do	7 1/2	15	18 1/2	45	20	14	80	87 1/2	do	80
70	McNae & O'Friel	Nov. 18 do	9	14	14	45	25	16	50	50	do	75
71	Thomas Smith	Nov. 23 do	10	14	17	45	25	18	40	45	40	250
72*	Brault & Cox	Nov. 23 do	10	14	17	45	25	18	40	45	40	250
73*	Chauncy Mears	1 do	8 1/2	15	16	40	25	27	46	46	13	260
74	E. Rosseman	Oct. 12 do	10	14	17	45	25	18	40	45	40	250
75	Latit & Hunter	Nov. 12 do	10	14	17	45	25	18	40	45	40	250
76	Raid & Nelson Merrick	Nov. 12 do	10	14	17	45	25	18	40	45	40	250
77	Guy, Johnson & Co.	Nov. 12 do	8	12	14	49	32	16	50	62 1/2	40	35
78*	Wiley & Debus	Oct. 21 do	10	10	10	40	24	15	50	94	40	100
79	Wiley & Debus	Oct. 21 do	10	10	10	40	24	15	50	94	40	100
80	Darmody & Egan	Oct. 12 do	7	14	26	40	25	15	37 1/2	37 1/2	40	50
81	do	do	7	14	26	40	25	15	37 1/2	37 1/2	40	50
82	Benard O'Friel & Sons	Sept. 15 do	8 1/2	12	18	40	18	17	40	37 1/2	-	50
83	do	do	8 1/2	12	18	40	18	17	40	37 1/2	-	50
84	Deamond, Rodarmel, & Co.	Nov. 21 do	8 1/2	11 1/2	15	50	15	14	37	33	12 1/2	300
85	Quinn & McLaughlin	Nov. 23 do	10	13	14	40	25	16	40	45	12 1/2	700
86	B. & A. Elliott	Nov. 23 do	9 1/2	14	14	42 1/2	23	16	40	45	12 1/2	300
87	McGoy & Watts	Nov. 23 do	9 1/2	14	14	42 1/2	23	16	40	45	12 1/2	300
88	do	do	9 1/2	14	14	42 1/2	23	16	40	45	12 1/2	300
89	Byers, McGoy, & Co.	Nov. 23 do	9 1/2	14	14	42 1/2	23	16	40	45	12 1/2	300
90	McGoy & Watts	Nov. 23 do	9 1/2	14	14	42 1/2	23	16	40	45	12 1/2	300
91	Thomas McQuoid	Oct. 10 do	8 1/2	12 1/2	48	25	14	50	62 1/2	62 1/2	40	45
41	Smith Noland, & Smith	Nov. 6 do	9 1/2	13	17	43	25	18	43	47	do	150

many others, ~~namely~~ ~~from each~~,
they reckon at 8 cents the cubic yard, throughout; and, allowing

* This enlargement, it is understood extends to 126 of the 186 miles.

they reckon at 8 cents the cubic yard, throughout ; and, allowing

STATEMENT of the several Lettings on the Susquehanna Division of the Pennsylvania Canal, between the mouth of Juniata and Northumberland.

NAMES OF CONTRACTORS.	Number of section.	Grabbing whole section.	PER CUBIC YARD.				PER FEET.			
			Excavation.	Embankment.	Puddling.	Solid rock.	Slab.	Hardpan.	Vertical wall.	Outer slope wall.
			CENTS.	CENTS.	CENTS.	CENTS.	CENTS.	CENTS.	CENTS.	CENTS.
Metlague & White	1	•	•	•	•	•	•	•	•	•
Conlon & Co.	2	10	8	12½	•	50	37½	14	60	40
Ell Russell	3	25	8	12	6	50	50	•	•	•
John Ryan	4	200	8	11	9	49	28	10	23	25
Barnett J. Daugherty	5	53	9	12½	8	48	18	14	•	70
Noland & Co.	6	75	9	12	16	40	20	20	•	•
Dodd & Co.	7	20	9	14	20	56	37	14	40	40
David & Noland	8	20	9	14	20	56	37	14	40	40
Dunn & Co.	9	75	10	12½	8	33	50	14	75	63½
John Ryan	10	75	10	12½	8	33	50	14	75	63½
John Ryan	11	75	10	12½	8	33	50	14	75	63½
John Ryan	12	200	9	15	23	62½	25	55	70	53½
John Ryan	13	130	11	13	23	62½	25	55	70	53½
Samuel Hopkins	14	250	10	15	15	45	25	15	60	45
Gleim, W. & S. Hunter	15	200	11	12½	12½	50	30	20	50	45
Ira and Hiram Mireck	16	150	10	12½	15	50	32	14	•	100
Woodward & Safford	17	87½	8	13	20	49	33	12	45	37
Woodward & Safford	18	97½	8	13	20	49	33	12	45	37
Ritter & Co.	19	125½	10	12½	20	50	16	17	62½	70
Provost & Co.	20	50	10	12	20	50	16	17	62½	70
W. Sullivan	21	188½	8	12	18	50	25	30	100	75
Hawes & Co.	22	430	10	12	12	43	30	17½	•	13
Henry Boniger	23	430	10	12	12	43	30	17½	•	13
Henry Boniger	24	95	9	12	12	43	30	17½	60	40
Henry Boniger	25	95	9	12	12	43	30	17½	60	40
Henry S. Woodward	26	10	8½	11½	17	60	23	18	62	50
Allen & Co.	27	50	7½	10	8	40	20	18	•	•
Salmon & Allen	28	100	7½	12½	14	40	25	15	•	10
John Foster	29	175	7	13	19	45	25	15	45	41
Peter Bowen	30	168	9	10	20	50	30	18	50	50
Hiram Larrabee	31	20	7	9	25	45	33	25	50	50
Peter Bowen	32	50	7	10	20	50	30	18	50	50
Ne-shir & Co.	33	55	7	12	43	37½	12½	13	65½	49
J. M. & R. Allen	34	100	7½	12	9	40	20	18	50	50
S. Gwynn & Co.	35	200	8	12	12	43	30	17½	•	13
Brier & Co.	36	250	8½	12	15	40	27	20	50	50
Brier & Co.	37	•	•	•	•	•	•	•	•	•
J. M. & R. Allen	38	50	7½	12	12	40	20	18	•	•
Stewart & Co.	39	250	8½	12	14	45	30	16	40	40
John Walls	40	25	9	12	14	46	30	20	50	49
John P. Schuyler	41	75	10	12	12	49	20	15	45	70
P. Ritter & Co.	42	120	7	12½	18	40	30	18	75	94
Stewart & Co.	43	150	7	12	14	40	25	16	56	60
J. M. & R. Allen	44	50	8	12½	12	45	30	18	49	50
John & G. Herold	45	50	7	12½	10	35	20	13	49	56
John & G. Herold	46	•	•	•	•	•	•	•	•	•
Andrew B. Mitchell	47	20	7½	14	15	40	27	20	50	50
Andrew B. Mitchell	48	•	•	•	•	•	•	•	•	•
John Foster, (of Millburg)	49	10	7½	12	7	40	12½	11	20	20
James Appleton	50	•	•	•	•	•	•	•	•	•
Ditto	51	175	9	12	14	50	18	17	45	56
Matthews J. App	52	100	9	11	12	40	18	17	40	50
Ditto	53	35	10	16	20	56	36	18	87½	57½
Geo. Bremer	54	200	12	20	30	50	30	18	57½	57½
Geo. Bremer	55	180	8	11	15	40	20	13	67½	70
Lessig & Myers	56	180	8	11	15	40	20	13	60	70
Cunningham & Co.	57	75	8	10	15	40	25	16	90	40
Morrow & Brady	58	180	7½	7	10	30	15	10	20	15
Morrow & Brady	59	175	6½	14	14	40	15	14	25	50
James Smith	60	•	•	•	•	•	•	•	•	•
H. W. Snyder	61	20	8	10	11	31	13	16	•	•
Nartin Weaver	62	50	7	12½	15	50	25	13	50	56
Padell & Co.	63	100	7½	9	15	30	30	20	37½	60
W. & J. Wall	64	60	7	12	20	37½	25	12½	13	40
J. W. Allen	65	150	7½	12	15	50	30	15	50	50
John Salmon	66	150	7½	12	15	50	30	15	50	50
John Salmon	67	50	8	12	15	50	30	15	40	50
Wm. Sternbergh	68	60	10	12	10	10	10	12	13	10
Ditto	69	25	8	10½	10	10	10	12	75	10
Dreadnoid & Co.	70	75	12	18	20	45	25	16	60	60
Wynn & Shannan	71	22	9	15	17	40	37½	15	16	50

In the last column, for inner slope wall, the prices are, in some instances, triple what they ought to be; but, as we do not consider it a necessary part of the contract to have the prices raised above the excavation, we have paid no regard to the prices stipulated in the proposal. We never authorize it to be made at a higher rate than 15 or 16 cents the square yard.

they reckon at 6 cents the whole party

450 dollars for a culvert and farm bridge, they compute its entire cost at 2,421 dollars. Another, including a road bridge, and a compensation for grubbing, and allowing 9 cents for excavation, they compute at 2,762 dollars.

A towing path along that, which is, in the report of the United States' Engineers, a river navigation of three miles, they convert into a continued canal; while they dispense, on the other hand, with a feeder at Evitt's creek, as unnecessary.

They greatly enlarge the estimate of the dam across the Potomac, below the mouth of the South Branch, beyond that of the United States' Engineers.

ENGINEER DEPARTMENT,

Washington, February 8, 1828.

SIR: I have the honor of transmitting to you, herewith, a copy of "an estimate of the cost of a canal to be made along the Potomac valley, on the Maryland side, from Cumberland to Georgetown," which was handed to me by Judge Geddes last night, as the result of the labors of himself and Mr. Roberts, and have the honor to be, with great respect, sir. Your most obedient servant,

ALEX. MACOMB, *Maj. Gen. Chief Engineer.*

To the Hon. CHARLES FENTON MERCER,

Chairman of the Committee of Roads and Canals,

House of Representatives.

Estimated cost of a Canal to be made along the Potomac valley, on the Maryland side, from Cumberland to Georgetown.

Subdivisions.			A canal of 40 feet surface, and 4 ft. deep.	* A canal of 48 feet surface, and 5 ft. deep.	* A canal of 60 feet surface, and 5 ft. deep.	Added by the Committee. The same subdivisions, estimated by the U. S. Engineers for a canal 48 feet wide and 5 ft. deep.
	Miles.	Yards.				
1	16	1,692	\$320,439	\$345,644	\$355,558	\$524,880 54
2	36	533	826,314	879,897	903,794	1,464,372 97
3	17	455	250,759	281,343	296,993	413,794 20
4	16	1,529	422,025	436,765	444,121	942,386 50
5	30	257	647,653	692,660	714,867	1,572,898 54
6	9	1,099	204,492	222,267	229,029	747,781 10
7	17	1,146	201,759	231,210	246,913	496,262 00
8	19	1,131	191,607	228,013	247,176	511,900 40
9	8	1,100	161,063	176,176	182,847	429,868 40
10	11	933	326,107	347,570	354,973	897,650 80
11	2	278	91,422	100,000	100,000	175,285 60
			\$3,643,640	\$3,941,545	\$4,075,571	\$8,177,081 05
Add 10 per cent. for contingencies -			364,564	394,154	407,557	
			\$4,008,004	\$4,335,699	\$4,483,128	

* This enlargement, it is understood extends to 126 of the 186 miles.

The estimate of Messrs. Geddes and Roberts, compared with the contracts for the eastern canals of Pennsylvania, will be found to exceed, rather than fall short of, a just computation. Correcting, however, estimates so much exceeding their own, it was natural that they should *over*, rather than *under* rate the cost of the various species of work, on which they had to put a calculation, differing from one which had obtained the sanction of high authority.

The annexed table of the contracts for extending the Pennsylvania canal, from the mouth of the Juniata, up that river and the Susquehanna, also corroborate this view.

*Exhibiting the Average Prices at which the various kinds of Work were taken, at the several Lettings on the Juniata
Division of the Pennsylvania Canal.*

[Rep. No. 141.]

27

Date of the Lettings.	No. of Sections let.	No. of Proposals for the work.	AVERAGE RATE AT WHICH THE WORK WAS GIVEN OUT.										Grubbing and Clearing.	
			Exca- vation.	Embank- ment.	Puddling	Solid rock.	Slate rock.	Hardpan.	Vertical wall.	Outside slope wall	Inside slope wall	Cts. per sq. yard.		
														Cents per cubic yard.
1827														
Aug. 15	35	724	9	13½	18½	42½	24½	19	39	49	13	170		
29	28	652	8½	12½	16½	42½	22½	17½	42½	45½	12½	76		
Sept. 12	28	562	8½	13	15½	43½	23½	17½	45	50½	12½	160		
Average of 91 sections,			8½	13	16½	42½	23½	18	42½	48½	12½	135½		

Upwards of 700 proposals were received between the 10th and 13th of October last, for doing the stone and wood work along this line of canal—which work has been allotted to competent bidders, at reasonable prices.

JAMES CLARKE, Superintendent.

CANAL OFFICE, MILLERSTOWN, November 24, 1827.

The Chairman of the committee, while at Harrisburg, in October last, was indebted to Mr. Mowry, one of the Canal Commissioners of Pennsylvania, for the subjoined table.

Extract of a letter from Simeon Guilford, Engineer of the Susquehanna division of the Pennsylvania Canal, which runs on the western bank of the Susquehanna, from a point opposite the town of Northumberland, to the mouth of the Juniata, being a distance of 37½ miles.

“RECAPITULATION.

Amount of excavation, embankment, &c.	-	-	\$ 344,538 36
9 locks of wood and rough stone, at \$ 1,800	-	-	16,200
1 guard lock of do 1,500	-	-	1,500
Dam at Shamokin ripples	-	-	37,984
Wasteweirs	-	-	4,000
30 miles of fence, at \$ 480	-	-	14,400
Embankment of locks and bridges	-	-	7,305 50
Excavation of foundations for locks, aqueducts, culverts, &c.			3,434 73
			<hr/>
			\$ 429,362 59
Add 10 per cent. for contingencies	-	-	42,906 25
			<hr/>
			\$ 472,298 84
			<hr/>

If stone locks should be adopted, the total expense of constructing the above 37½ miles of canal, with sixty-two feet of lockage, would be \$ 524,298 84.

If the line of canal is extended to the mouth of the Juniata river, and terminated on a level corresponding with that on the eastern bank, there must be added to this amount the cost of constructing 24⁴¹/₁₀₀ feet of lockage, and about 1½ miles of canal.

All which is respectfully submitted,

SIMEON GUILFORD,

June 28, 1827.

Engineer.”

LIVERPOOL, November 23, 1827.

SIR: In obedience to your request. I have the honor to submit the following statement of the total cost of the Susquehanna division of the Pennsylvania Canal, from the west branch of the Susquehanna river, to a point near the head of Duncan's Island, viz :

Total cost of excavation of earth in canal	-	-	\$ 80,985 10
do do rock	-	-	20,764 51
do do slate	-	-	2,448 47
do do hardpan	-	-	3,516 80
do embankment	-	-	53,518 92
do puddling	-	-	19,776 32
do outer slope wall	-	-	25,029 42
do inner do	-	-	7,583 55

Total cost of vertical wall,	-	-	-	-	\$11,268 15
do grubbing do	-	-	-	-	7,544 75
do wasteweirs	-	-	-	-	4,200
do fencing	-	-	-	-	9,072
do channel in river	-	-	-	-	2,090
do road	-	-	-	-	20,596
do 2 miles towing path and mound	-	-	-	-	24,594
9 locks and one guard lock, inclusive of all expenses	-	-	-	-	59,517
58 bridges, inclusive of embankments	-	-	-	-	24,599 60
39 culverts	-	-	-	-	10,168
2 aqueducts	-	-	-	-	10,022 71
1 dam across Susquehanna river, inclusive of raft gap, iron work, and filling in above the dam	-	-	-	-	25,450
1 dam across Penn's creek	-	-	-	-	2,080
feeder and step gates at Shamokin ripples	-	-	-	-	2,200
1 do do at Berry's Falls	-	-	-	-	14,416
					<hr/>
					\$441,350 76

In making the above statement, the several items of the amounts have been calculated at the contract prices, with a few exceptions of work not under contract, to which fair prices have been affixed, and calculations made accordingly. In calculating the amount of rock, slate, and hardpan, a comparative estimate, for part of the amounts, has been made, from the quantities of those several items found in the progress of the work.

Respectfully submitted by, sir, your most obedient servant,

SIMEON GUILFORD, *Engineer.*

CHARLES MOWRY, Esq. *Acting Commissioner*

upon the Susquehanna division of the Pennsylvania Canal.

The evidence derived from contract prices of the work let on the Susquehanna, as well as of the work already executed, however contradictory of the estimates of the United States' Engineers for a similar work on the Potomac, would be corroborated by the result of similar inquiries in other parts of the United States, in which similar enterprises are now in progress.

The committee will add, however, but one, which has been recently obtained from the Farmington Canal of Connecticut.

GENERAL REMARKS ON THE FARMINGTON CANAL, AND THE WORKS
CONNECTED WITH IT.

To the President and Directors of the Farmington Canal.

MESSRS :

In obedience to your request, I herewith present you, in a tabular form, an abstract of the contracts of the Farmington Canal, exhibiting the prices of the various kinds of work performed in the construction of said canal, in answer to the inquiries of C. F. Mercer, Esq. Chairman of the Congressional Committee on Roads and Canals.

That the prices of excavation, in similar qualities of soil, should appear so various, is generally to be accounted for by the different depths of digging, and the consequent greater distance of transporting the earth, to discharge it from the canal. In all cases where the distance, from which materials for embankment were carried, does not exceed a hundred feet, such distance is not noticed in the table.

The construction of the locks is a wooden frame, planked watertight, and supported by walls of dry masonry ; and, as the price of wood work, per foot-lift, varies in different lifts, I give an average of the whole, which is $119\frac{1}{2}$ dollars. The price of stone work, per perch of sixteen and one-half solid feet, is 1.10 dollars, and is uniform through the whole. The average cost of the lock, per foot-lift, including puddling at the head, is 258 dollars. The length, in the clear, is eighty feet, and the width twelve.

The only aqueduct on the line conducts the canal over the Farmington river, and is two hundred and eighty feet long, consisting of a wooden trunk, supported by stone abutments and piers of solid masonry, and rising to the height of forty feet above the foundations.

The dam across Farmington river, at the head of the feeder introduced from that stream, of which the work is far advanced, and its completion only prevented by the frequent floods and continued high water of last Autumn, is the only work of the kind connected with the canal. Its construction is of stone, laid in hydraulic mortar ; is eleven feet high ; has a waste or tumbling-way, of two hundred and four feet long, and supported by abutments at the ends, rising above the height of the floods. The work was contracted for at 1.80 dollars per perch.

The bridges are of a very simple, yet firm, structure, extending quite over the canal, and supported, at each end, by stone abutments of dry masonry ; leaving the canal of its usual width, and free for the passage of boats, as in other places. The road bridges are forty-two feet long, and fourteen wide, and cost, exclusive of the abutments, from 74 to $83\frac{1}{2}$ dollars : the farm bridges are the same in length, and twelve wide, and cost 58 to 67 dollars.

The dimensions of the canal are, twenty feet width at bottom ; thirty-four to thirty-six at water line ; and four feet depth. Its length is $55\frac{1}{2}$ miles ; commencing at New Haven harbor, in a basin of twenty acres capacity, and extending, northerly, through the towns of Ham-

den, Cheshire, Southington, Farmington, Simsbury, and Granby, to the north line of the State : the whole of which is now ready to receive the water, and, indeed, with the exception of about three miles, has already received it, without the aid of the principal feeder at Farmington. It now offers to the stockholders, who have so laudably embarked their capital in the enterprise, and to the community at large, equally interested in its success, the gratifying prospect of seeing it successfully opened for business early in the ensuing Spring. As this work was intended but as the incipient step of a great and important chain of canal communication, to be finally extended to the northern boundary of our national territories, measures have been successfully taken to promote this primary object. The Hampshire and Hampden Canal, which is a continuation of the Farmington Canal, being, as it were, but the annual growth of the same shoot, is rapidly progressing in its construction, and now exhibits a fair prospect of being completed in the course of the present year. Its length is 30 miles, passing from the northern termination of the Farmington Canal, through the towns of Southwick, Westfield, Southampton, Easthampton, and uniting with the Connecticut river at the pleasant and flourishing village of Northampton. As a further step towards the advancement of this important public improvement, a survey has been carried on from Northampton to Brattleborough, in Vermont ; and, for the facilities with which this section of the route can be constructed, reference is made to the report and particular estimates of the engineer who made the examination, which is now before the public, and from which it will be seen that the cost of construction falls within the very moderate sum of eleven thousand dollars per mile ; a minimum of expense, in the construction of canals, for which a parallel can hardly be found, except in the Farmington and Hampshire and Hampden Canals, which fall even below that very moderate rate.

Later examinations, about the close of the past year, have been extended as far north as White River Falls, in the town of Lebanon, New Hampshire ; but, from the recent date of the survey, the estimates of expense are not yet completed ; though it is understood that the difficulties are but very little, if any, increased above those of the southern sections in Massachusetts and Connecticut.

When the Farmington Canal shall have been put into successful operation, and connected with the projects already mentioned, in the contiguous States, extended, as they no doubt will be, to the north line of Vermont, it will form a line of communication, advantageous alike to these States and to the nation. It will be one instrument of the vast apparatus setting up throughout the country, for imparting national strength and vigor : for it will not only give a spring to enterprise, in the sections through which it passes, and, by increasing industry and wealth in this portion of the community, do its part towards the general prosperity, but it will afford the means of ready communication between distant parts. It will bring northern sections of the United States nearer to an intercourse with the more central ; giving union and compactness to what might seem naturally divided.

reconciliation, has prevented me, until this time, from giving you the

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TABLE, exhibiting the prices of various kinds of work performed in the construction of the different sections of the Farmington Canal.

Summit Level. No. of sections.		EXCAVATION AND REMOVAL OF MATERIALS.										EMBANKMENT.		WALLS OF DRY MASONRY.		PORTLAND WALLS OF RAIN-WATER BASIN.	
		Common soil and sand.	Clay and gravel.	Hard gravel.	Hard pan.	Quick-sand.	Loose stone blinding.	Red shale and sand in part.	Trap rock in blinding.	Solid trap rock in situ.	Distance hauled, in feet.	Price per cubic yard.	The perch of 169 c. ft. shovel work in N. Haven aqueduct.	Bridge abutment perpendicular.	Range work in aqueduct.	Arch in culvert.	
1	8 Cts.	•	•	•	•	•	•	•	•	•	300	8 Cts.	78 Cts.	•	•	\$3 00	
2	7	•	•	•	•	•	•	30 Cts.	60 Cts.	•	•	12½	•	•	•	•	
3	6½	•	•	•	•	•	•	•	•	•	•	10	•	•	•	•	
4	6	•	•	•	•	•	•	50	•	•	120	10	•	•	•	•	
5	7	•	•	•	•	•	•	•	•	•	•	12½	•	•	•	•	
6	9½	•	•	•	•	•	•	•	•	•	•	10	•	•	•	•	
7	8	•	•	•	•	•	20 Cts.	35	•	•	•	7	•	•	•	•	
Farmington level.																	
1	7	•	•	•	•	•	•	•	•	•	450	11½	•	•	•	2 70	
2	6	•	•	•	•	•	•	•	•	•	200	10	•	•	•	•	
3	6	•	•	•	•	•	•	•	•	•	•	10	•	•	•	•	
4	6	•	•	•	•	•	•	•	•	•	400	11	•	•	•	2 35	
5	6	•	•	•	•	•	•	•	•	•	150	10	•	80	•	•	
6	6½	•	•	•	•	•	•	•	•	•	•	8	•	•	•	2 35	
7	6	•	•	•	•	•	25	•	•	•	•	10	•	•	•	2 35	
8	6½	•	•	•	•	•	•	•	•	•	500	10	•	•	•	2 45	
9	6	•	•	•	•	•	•	•	•	•	400	10	•	•	•	2 45	
10	6	•	•	•	•	•	•	•	•	•	•	9½	•	•	•	•	
11	6½	•	•	•	•	•	•	•	•	•	250	10	•	•	•	2 45	
12	6	•	•	•	•	•	•	•	•	•	450	10	•	•	•	2 45	
13	6	•	•	•	•	•	•	•	•	•	500	10	•	•	•	2 45	
14	6½	•	•	•	•	•	•	•	•	•	250	10	•	•	•	2 45	
15	5½	•	•	•	•	•	50	•	•	•	250	10	•	•	•	2 45	
16	5	10	•	•	•	•	•	•	•	•	200	10	•	•	•	•	
17	7	•	•	•	•	•	•	•	•	•	250	9	•	•	•	2 45	
18	6	•	•	•	•	•	30	•	•	•	250	9	•	•	•	2 45	
19	6	•	•	•	•	•	•	•	•	•	400	10	•	•	•	•	
20	7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
21	9	•	•	•	•	•	•	•	•	•	125	10	•	•	•	•	
22	9	•	•	•	•	•	•	•	•	•	•	10	•	•	•	•	
23	7½	•	•	•	•	•	•	•	•	•	450	10½	•	•	•	•	
24	7½	•	•	•	•	•	•	•	•	•	250	10	•	•	•	•	
25	6	•	•	•	•	•	•	•	•	•	175	8	•	•	•	•	
26	6	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
27	6	•	•	•	•	•	•	•	•	•	450	8	•	•	•	•	
28	6	•	•	•	•	•	•	•	•	•	250	10	•	•	•	•	
29	5½	12½	•	•	•	•	•	•	•	•	150	8	•	•	•	•	
30	5	•	•	•	•	•	•	•	•	•	200	7	•	•	•	•	
31	5½	•	•	•	•	•	40	•	•	•	•	•	•	•	•	•	
32	4	•	•	•	•	•	•	•	•	•	•	6½	•	•	•	•	
33	5½	5½	•	•	•	•	•	•	•	•	•	6	•	•	•	•	
34	4½	•	•	•	•	•	•	•	•	•	150	7½	•	•	•	•	
35	5	•	•	•	•	•	•	•	•	•	200	6½	•	•	•	•	
36	4½	•	•	•	•	•	•	•	•	•	•	8	•	•	•	•	
37	4½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
38	4½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
39	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
40	4½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
41	4	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
42	5½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
43	5½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
44	6½	12½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
45	5	10½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
46	6½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
47	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
48	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
49	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
50	•	10½, 12	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
51	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
52	7	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
53	9	9½, 15	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
54	•	9	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
55	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
56	6	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
57	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
58	5½	•	•	•	•	•	•	•	•	•	250	7	•	•	•	•	
59	4	•	•	•	•	•	•	•	•	•	500	8	•	•	•	•	
60	4	•	•	•	•	•	•	•	•	•	125	6	•	•	•	•	
61	5	10	•	•	•	•	•	•	•	•	175	10	•	•	•	•	
62	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
63	7	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
64	13	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
65	65	12½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
66	•	10½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
67	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
68	8½	10½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
69	8	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
70	8	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
71	5½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
72	8½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
73	6	8½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
74	8	6½	•	•	•	•	•	•	•	•	150	7½	•	•	•	•	
75	4	•	•	•	•	•	•	•	•	•	180	6½	•	•	•	•	
76	6½	•	•	•	•	•	•	•	•	•	400	8	•	•	•	•	
77	6½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
78	5½	•	•	•	•	•	•	•	•	•	250	8	•	•	•	•	
79	•	•	•	•	•	•	•	•	•	•	2,000	24	•	•	•	•	
80	6	•	•	•	•	•	•	•	•	•	2,000	17	•	•	•	•	
81	6	•	•	•	•	•	•	•	•	•	1,200	10	•	•	•	•	
82	5	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
83	8½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
84	5	•	•	•	•	•	•	•	•	•	350	5	•	•	•	•	
85	4½	•	•	•	•	•	•	•	•	•	350	5	•	•	•	•	
86	•	•	•	•	•	•	•	•	•	•	250	7	•	•	•	•	
87	9½	•	•	•	•	•	•	•	•	•	400	9	•	•	•	•	
88	4	•	•	•	•	•	•	•	•	•	250	7	•	•	•	•	
89	5½	•	•	•	•	•	•	•	•	•	•	6	•	•	•	•	
90	3½	•	•	•	•	•	•	•	•	•	•	4	•	•	•	•	
91	3½	•	•	•	•	•	•	•	•	•	200	8	•	•	•	•	
92	3½	•	•	•	•	•	•	•	•	•	•	6½	•	•	•	•	
93	3½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
94	9½	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
95	5	•	•	•	•	•	•	•	•	•	200	10	•	•	•	•	
96	•	12	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

The foregoing table of prices for work in the construction of the Farmington Canal is correct.
14th January, 1828.

DAVIS HURD, Chief Engineer.

communication between distant parts. It will bring the remote portions of the United States nearer to an intercourse with the more central ; giving union and compactness to what might seem naturally divided.

reconciliation, has prevented me, until this time, from giving you the

communication between distant portions of the United States nearer to an intercourse with the more central ; giving union and compactness to what might seem naturally divided.

A LIST OF CONTRACTS entered into on the Kiskiminitas Line, on the 2d day of July, 1827, a distance of 20 miles, and the amount of labor that has been performed under these contracts.

No. of Sections.	NAMES OF CONTRACTORS.	THE AMOUNT OF WORK DONE.				REMARKS.					
		Excavation of earth.		Embankment.	Excavation of rock.						
		Per Cubic Yard.	Wall per perch, 25 entire ft.								
1	Le Baron & Lathrop	9	12	45			Excavation of earth.	Excavation of rock.	Embankment.	Wall.	
2	Wm. W. & J. H. Jones	9	12	45			5,633	954	2,916		
3	George D. Foreman	7	9	45			6,250	2,681			
4	James Andrew	7	9	35			5,568	1,701			
5	J. & R. Baker, Towens & Co.	7	9	44			5,238	1,588			
6	Powers, Sackett, Powers & Co.	8	11	38			8,508	12,792			
7	Brown & McLaughlin	8	10	30			7,913	8,843			
8	McClusky & Barr	7	11	28			6,755	7,725	5,984		
9	Mahon & Brider	8	10	45			6,755	7,725			
10	Richards & Hill	7	9	45			4,674	2,065	3,403		
11	Richards & Hill	7	9	45			6,634	1,855	6,730		
12	Richards & Hill	7	9	45			6,730	1,855	6,675		
13	D. & S. Kinsler	7	13	49			6,730	2,011	665		
14	James Spaul	7	12	49			13,259	14,701			
15	McClusky & Barr	7	11	37			7,305	7,825			
16	McClusky & Barr	7	11	37			6,895	5,283	1,450	735	
17	Moran, Smith, & Brenner	7	9	36	\$1.00		6,905	11,840			
18	Ball, Boyd, & Everitt	8	9	45			7,450	794	1,921		
19	Thompson & Waldo	7	9	40			5,356		5,550		
20	Johnston & Sawyer	6	8	50			3,377	160	100		
21	Johnston & Sawyer	6	8	50			6,530		2,989		
22	Thomas Neal	7	10	40			7,390				
23	Thomas Neal	7	10	40			7,390				
24	Daniel Gilman	7	9	45			7,390				
25	Daniel Gilman	7	9	45			7,390				
26	M. & P. McDermott	6	11	40	75		1,163	941			
27	M. & P. McDermott	6	11	40	75		1,163	941			
28	Joseph Rabson	6	8	50	75		1,185	338			
29	Peter Duffy	6	8	50	75		1,185	338			
30	Peter Duffy	6	8	50	75		1,185	338			
31	Dickey & McFarland	7	9	40			1,401				
32	Dickey & McFarland	7	9	40			1,401				
33	Banks & McLaughlin	8	10	38			2,136				
34	Sullivan & Wiley	8	11	40	70		5,500	475			
35	Gruet, Gruet, & McDermott	7	8	37			3,356	966	7,989		
36	McCreagh & Arvin	6	6	30			2,592	5,011			
37	McCreagh & Arvin	6	6	30			3,041				
38	McCreagh & Arvin	6	6	30			1,136	98	4,544		
39	O'Brien, McGram & Co.	6	11	44	75		2,038	453	1,875		
40	Keple & Calhertson	6	8	50			2,160		4,100		
41	Keple & Calhertson	6	8	50			2,160		4,100		
42	Keple & Calhertson	6	8	50			2,160		4,100		
43	Stewart, Wallace & Stewart	7	10	40	75		3,189	330	5,894		
44	Stewart, Wallace & Stewart	7	10	40	75		3,189	330	5,894		
45	Stewart, Wallace & Stewart	7	10	40	75		3,189	330	5,894		
46	J. H. Merrill	7	10	40			3,189	330	5,894		
47	Colbertson, Windrum & McKee	7	10	40			3,189	330	5,894		
48	McDermott & Gabry	7	8	37			1,400	200	3,850		
49	Henry Hall	7	9	30			2,709	1,048			
50	Glen, Kilm, & South	8	8	33			6,155	20	310		
51	Alexander Spaul	6	6	30			3,753	50	3,504		
52	John McGlade & Co.	6	8	37			5,721	80			
53	Milligan, McCutchen & Rowley	7	10	30			5,990	2,320	2,894		
54	John McGlade & Co.	7	8	45			2,870	1,220	310		
55	Edward & William Denvir	6	6	30			4,700	89	410		
56	Couch, Linn & Couch	6	6	30			4,700	89	410		
57	McMillen, Penock & Co.	6	6	30			4,700	89	410		
58	McMillen, Penock & Co.	6	6	30			4,700	89	410		
59	Boyer & Duffy	6	6	30			4,700	89	410		
60	Boyer & Duffy	6	6	30			4,700	89	410		
61	Boyer & Duffy	6	6	30			4,700	89	410		
62	Prepout, Harrison & Doyle	8	10	40			1,000	500	1,500		
63	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
64	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
65	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
66	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
67	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
68	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
69	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
70	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
71	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
72	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
73	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
74	Hickenloper & Johnston	6	10	40			1,000	500	1,500		
75	Boyle, Wilson, & Boyle	7	9	40			1,000	500	1,500		
76	Boyle, Wilson, & Boyle	7	9	40			1,000	500	1,500		
77	Boyle & Wilson	7	9	40			1,000	500	1,500		
78	Boyle & Wilson	7	9	40			1,000	500	1,500		

No. of Sections.	NAMES OF CONTRACTORS.	List of locks.	Price per perch.	Culverts on	Names of Contractors.	Spaul.	Price per perch.
1	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 4	James Andrew	4 ft. 32 35
2	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 9	Robert Braden	10 2 25
3	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 13	Richards & Hill	10 2 25
4	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Nathan Waldo	10 2 25
5	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
6	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
7	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
8	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
9	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
10	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
11	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
12	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
13	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
14	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
15	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
16	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
17	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
18	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
19	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
20	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
21	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
22	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
23	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
24	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
25	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
26	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
27	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
28	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
29	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
30	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
31	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
32	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
33	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
34	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
35	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
36	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
37	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
38	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
39	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
40	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
41	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
42	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
43	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
44	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
45	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
46	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
47	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
48	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
49	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
50	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
51	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25
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61	Johnston, Brown & Sawyer	10	\$4.00	This was forfeited by the first contractor, it being a very difficult river lock.	Sec. No. 20	Henry McGlade	10 2 25

McFarland & Lafferty

Hill, Boyer, & Atkinson

Guard books

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of the United States nearer to an inter-
giving union and compactness to what might seem naturally divided.

12,490	5,700	1,510	•
11,090	650	610	1,400
19,170	1,100	2,400	3,000
7,420	4,950	16,000	•
9,000	4,800	200	•
12,650	50	225	•
12,000	•	•	1,800
6,970	15,000	4,730	250
8,225	2,700	1,575	3,000
2,790	19,850	13,210	500
9,250	4,350	1,690	•
•	229	180	•

me
cerns upon the line of canal under my superintendence, rendered more difficult by a season more unfavorable than any season within my recollection, has prevented me, until this time, from giving you the

of the United States nearer to an increase
giving union and compactness to what might seem naturally divided.

A LIST of Contracts entered into at Blairsville, for the Kiskiminnias and Conemaugh Division of the Pennsylvania Canal, on the 28th day of October, 1827, together with the estimated cost of the Engineer, and the amount of work on each section.

No.	Section.	NAME OF CONTRACTOR.	ESTIMATED QUANTITY OF WORK TO BE DONE.				THE AMOUNT OF WORK.				Rock, yards.	Embankment, yards.	Excavated earth.	Embankment.	Rock.	Stone wall and pavement.	FENCES.
			Excavation of earth per cubic yard.	Embankment of earth per cubic yard.	Excavation of rock per cubic yard.	Embankment of rock per cubic yard.	Earth, yards.	Embankment, yards.	Rock, yards.	• • •							
CENTS.																	
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No. of Locks.

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CANAL OFFICE, January 9, 1828.

DEAR SIR: The annexed is a list of the contracts made on the Kiskiminnias and Conemaugh division of the Pennsylvania Canal, at the letting in Blairsville, in October last; and a distance of 25 miles. You will at once see the difference between the estimate made by the Engineer previous to the letting, and the prices that the work has been contracted for. Although this difference is not very great, it is nevertheless considerable, and it is to be regretted that it is so. It is to be regretted that it much exceeds the prices contracted for; yet the contractors are doing the work much more rapidly than was anticipated at the time of giving out the contracts, and, in not a single instance, has a contractor forfeited his job.

In relation to the stone work, you will recollect, sir, that each perch of mason work must contain 25 cubic feet; also, that the foundations, gates, and iron are included in the price, per perch, for the locks. The above short statement will arrive in time to be of some little service to you; and, in the course of a very few days, you shall be furnished with one in relation to the other parts of the Western division.

I am, very respectfully,

Your obedient servant,

R. S. KEEN.

To the Hon. C. F. MENCER,
Washington City.

Each lock of eight feet lift contains about 1,000 cubic yards of stone masonry.

of the United States nearer to an intercourse with the
giving union and compactness to what might seem naturally divided.

And, should any sudden exigency of invasion create a necessity for military measures, this, with other similar works, widely extended, will offer the means for concentrating the force of the country upon the threatened points, with the least expense and delay. Primarily, these works form a strong local interest for their execution; but, when executed, their general advantages are no less desirable and secure.

With sentiments of high respect,

I am, gentlemen,

Your very obedient servant,

DAVIS HURD,

Engineer of the Farmington and Hampshire and Hampden Canals.

NEW HAVEN, 14th January, 1828.

ESTIMATE of the western section of the Chesapeake and Ohio Canal.

Messrs. Geddes and Roberts had not sufficient time, after they entered upon their survey of the Potomac, to extend it to the valleys of the Monongahela, the Youghiogeny, and Casselman rivers, up which the western section of the Chesapeake and Ohio Canal will extend, from Pittsburg, towards the base of the Alleghany. But the annexed tables of the actual contract prices of the canals of Pennsylvania, constructing from the same point up the Alleghany, Kiskiminitas, and Conemaugh rivers, towards the Laurel Hill, answer every necessary purpose, and are entitled to greater confidence, in forming a correct estimate of the cost of this section of the Chesapeake and Ohio Canal, than any survey and estimate not tested by actual experience: the natural impediments of the latter canal, passing over similar ground with the former, being known not to exceed those which have been surmounted on the former.

The contract prices of the work, let on the Alleghany Canal in 1826, having been supplied by the former report, those only of the last year are hereto subjoined in the form in which they have been received from General Abner Lacock, the Acting Commissioner of the western Canal of Pennsylvania.

PITTSBURG, January 2, 1828.

DEAR SIR: I have just returned from Harrisburg, where my attendance, with the other members of our Canal Board, was required, at an early period, to prepare a report for the Legislature. To settle an account of more than half a million of dollars, it was necessary for me to take Mr. Keen with me. This, with the multiplied concerns upon the line of canal under my superintendence, rendered more difficult by a season more unfavorable than any season within my recollection, has prevented me, until this time, from giving you the

information you wished, at an earlier day. The annual report of the Canal Board has been made and will be printed ; but, as this report and documents will be voluminous, I send you the following abstract, taken from my report, and shall next week, through Mr. Keen, furnish you with the detailed statement you wished.

The successive and constant rains have saturated the earth with water, and given a full opportunity of seeing the extent of injury we are to expect from hill-slips on the Allegany river ; they are by no means serious, and the increased expense they will produce will not be great. Shortly after you left us, a sudden rise in the river took away a part of the feeder down on the Kiskiminitas ; the rains continuing, I found it indispensably necessary to suspend the work on the dams, and the aqueduct over the Allegany river, until the water falls in the Spring. When you receive the statement from Mr. Keen, you will be in possession of facts in detail, which, taken in connexion with the general results I now send, will enable you to make an estimate with sufficient accuracy for all practical purposes of the expense of a canal on the west of the mountains ; and when you make the allowances for expensive aqueducts over the Allegany river, and other works of the same nature, you will perceive nothing discouraging in the undertaking you are advocating. Your's most truly,

A. LACOCK.

CHARLES F. MERCER, *M. C.*

The following extract from a communication of A. Lacock, Esq. dated Canal Office, December 15, 1827, to the Board of Canal Commissioners of Pennsylvania, gives the result of all the operations under those contracts, down to the middle of December last :

“By the voluminous reports of the Engineers, the Board will learn what has been accomplished, and what remains to be done, on this division of the Pennsylvania Canal, of which the following is a brief extract :

There has been, of			
Excavation of earth	-	-	yards, 1,522.436
Do rock	-	-	350.857
Embankment made	-	-	692.718
Stone wall for protection	-	-	perches, 22.398
Mason work in locks, aqueducts, culverts, and bridges	-	-	32.307

It must be evident that the principal expense of a lock and canal navigation will arise from, and be applicable to, the work comprehended under the foregoing heads, taken conjointly ; and to settle a question that has been made a subject of dispute, an exact average has been made of the actual cost, on each branch of the work upon this line, and the following result has been obtained :

			D.	C.	M.
Average price of earth, per cubic yard	-	-	00	07	1
rock, do	-	-	00	39	7
embankment	-	-	00	10	2
wall, per perch	-	-	00	52	5
road and farm bridges	-	-	145	00	0
fencing canal, by the perch, with posts and boards	-	-	00	75	0
locks, per foot lift, complete	-	-	578	50	0

The gross amount of money received, by the acting Commissioner, from the Treasurer of the Board,					
has been, up to this date,	-	-	510,500	00	0
And his disbursement in the public works amount to			535,816	42	0
Leaving the balance due him from the Commonwealth			25,316	42	0

And it is but an act of common justice to state that the duties performed by the gentlemen composing the Engineer Department, were not only arduous, but severe, and it is to their industry and perseverance that the public are indebted for the rapid progress made in the work this season ; and when the amount of labor done, and the style in which it has been executed, is taken into the account, there can be no hazard in saying that it has cost less than any public work of the kind in the United States.

By a report made in the Fall of 1825, the Board will recollect that the danger to be apprehended from hill slips, upon the Alleghany river, was strongly represented, and the acting Commissioner is now free to declare, that all his former apprehensions have been realised. Near thirty sections on the line, between Pittsburg and the Kiski-

minitas, have been subject, less or more, to this inconvenience ; and it will be seen by the report of Mr. Harris, that this, and a few items of expense omitted, will increase the expense of constructing this line of canal, and raise it, upon these sections, above the estimate of N. S. Roberts, Esq. the former engineer. But on the residue of the work upon the line, it has been found, when completed, to cost less than the estimate of that gentleman. But this formidable obstacle has been, in a great measure, overcome ; for, notwithstanding the excessive rains that have, for two months, past saturated the earth with water, there is no part of the line, were the canal supplied at this time with water, in which the navigation would be obstructed ; and it is proper here to observe, that no hill slips of any consequence have taken place upon the Kiskiminitas line, and it is confidently believed, from the nature of the ground, that none will occur."

The day after the letting of the contracts last referred to, the Chairman of the Committee, in a tour of observation upon the Pennsylvania Canals, arrived at Blairsville, a small village on the Conemaugh. It was supposed that 1,500 persons had assembled to bid for those contracts, and the Canal Commissioner, Gen. Lacock, estimated the number of bids for various species of work, at not less than 10,000. All who failed of success, and less than one hundred could be gratified, went away much disappointed. Their current declaration was, when asked if they would undertake similar labor on the Chesapeake and Ohio Canal, that they would most readily do so. Indeed, many of them had removed to Pennsylvania from New York, in order to continue the employment in which they had been occupied, both there and in Ohio, for several years.

There remain now, in order to close this testimony, and to remove forever the load with which an unfavorable estimate has hitherto overwhelmed this work, but some views to be taken of the proposed connection of the Eastern and Western sections of the Chesapeake and Ohio Canal, by a tunnel, or subterranean water passage for boats, through the Alleghany mountain, and a brief summary of the probable cost of the entire canal.

Tunnels, in England, are now so common as to excite little curiosity. On a rail-road in Scotland, but a few miles in extent, as many as three are proposed to be constructed, to obviate the necessity of passing over or around elevated ground. Near a mile of that which constitutes the first labor, upon the rail-road, leading from the wharves of Liverpool, to the town of Manchester, was completed, when the last intelligence of the progress of this costly* work was received from England. One mile of the tunnel at Hare Castle, in England, was finished in a year ; and by the next December, four tunnels will have been completed on the various canals of Pennsylvania.

The following table presents the estimate of the tunnel of the proposed Chesapeake and Ohio Canal by the United States' Engineers.

* This rail-road of 32 miles in length, is computed at more than \$ 2,000,000. The estimate, according to the present rate of exchange between the United States and Great Britain, exceeds this sum considerably.

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DETAILED ESTIMATE OF A TUNNEL.

CONSOLIDATED ESTIMATE.							RECAPITULATION.			
	EXCAVATION.		MASONRY.		Draining.	Total cost.		Cost of	Cost of Masonry.	Total cost,
	Cubic content.	Cost.	Cubic content.	Cost.				Excavation.	including inci-	
									dental items.	
	Cubic yards.	Dolls. Cts.	Cubic yards.	Dolls. Cts.	Dolls. Cts.	Dolls. Cts.		Dolls. Cts.	Dolls. Cts.	Dolls. Cts.
Shafts, - - - -	38,704.52	109,935 95	21,499.70	123,097 00	159,469 30	392,502 25	Shafts, -	97,560 95	110,722 00	233,032 95
Heading and side heading,	32,112.85	77,531 50	20,047.65	313,707 60	-	391,239 10	Draining, -	-	-	159,469 30
Tunnel, - - - -	473,923.00	603,047 04	74,546.40	1,892,195 76	-	2,495,242 80	Heading, -	75,463 90	308,070 93	383,534 83
							Side heading,	2,067 60	5,636 67	7,704 27
							Tunnel, -	603,047 04	1,892,195 76	2,495,242 80
Total, - - - -	544,740.37	790,514 49	116,093.75	2,329,000 36	159,469 30	3,278,984 15	Total cost of tunnel, 4 miles and 80 yards in length, the ground supposed to be * slate rock and sand stone. }			3,278,984 15

S. BERNARD, *Brig. General, Member of the Board of Internal Improvement.*
 WILLIAM TELL. POUSSIN, *Capt. Top. Eng'rs.*
 WM. HOWARD, *Civil Engineer,* } *Assistants to the Board.*

* The Lebanon tunnel is through slate rock, and is not lined with masonry.

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In the preceding estimate, the masonry or walling of each of forty working shafts, is computed at 10.30 cents the cubic yard of 25 solid feet, supposed to be of bricks and mortar. That of the heading and side heading, at 18.18 cents per cubic yard; of the entire lining, bottom, sides, and arch, of the tunnel, at 11.86 cents per cubic yard, for 74,546.40 cubic yards, constructed with common lime mortar, and at 14.81 cents per cubic yard for 68,067.20 cubic yards, executed with mortar of hydraulic lime. This cost exceeds three times the price, by actual contract, of the cut stone lining of the Pittsburgh tunnel.

Four steam engines, of 6 horse power each, employed on the shafts, are computed at \$3,500 each, and 8 of 10 horse power, at \$5000 each; while \$500 more are allowed for fixing each engine at the shaft. Their operation in draining the cost of pumps is computed at \$119,469.30.

The committee are assured that 40 engines, or one for each shaft, could be purchased and set up at the shafts for less than the sum here allowed for the twelve, and their first erection, which is \$60,000.

They have reason to believe that the tunnel will be excavated, throughout, in sand-stone rock, requiring no walling, either for itself or its shafts, except near the surface of the mountain; and that its entire cost, after enlarging its dimensions so as to admit within it the passage of boats, by each other, in opposite directions, will not exceed one moiety of its computed cost.

After the completion of the eastern section of the canal, exterior side walling, the most costly part of its construction, will be almost entirely dispensed with, through the mountain section, and be seldom required on the western. Supposing, therefore, the lockage of what is denominated the middle section, between Cumberland and the mouth of Casselman's river, embracing an ascent of 1,961 feet, in less than 71 miles, to cost \$1,000 the foot lift, or, in all, \$1,961,000, and the summit level, including the tunnel of four miles, \$1,539,000 more, there will remain two millions and a half of the sum of ten millions of dollars to construct about 145 miles of canal, embracing, in the last eighty-five miles next to Pittsburg, but 619 feet of additional lockage. The cost of this lockage cannot be estimated at more than \$600 the foot lift, allowing for it the largest dimensions which have been proposed, which cost, being deducted from the sum of $2\frac{1}{2}$ millions, will leave two millions one hundred and twenty-eight thousand six hundred dollars for the residue of one hundred and forty-five miles of canal; a sum, it is believed, more than adequate to its construction, since an offer has been made, by the able Commissioner of the western canal of the State of Pennsylvania, to construct the 100 miles of this work next above Pittsburg, at ten thousand dollars the mile, leaving but forty-five miles, of which, the cost of the entire lockage and tunnel has been already provided, including the necessary dams and feeders of the summit level, to be completed with a sum exceeding eleven hundred thousand dollars.

But if the lockage of the mountain section shall derive its stone from the adjacent excavation, as may be confidently expected, its cost will be found to have been overrated near one million of dollars; so

that a computation of the entire canal of the Chesapeake and Ohio Canal at 10,000,000 of dollars, cannot be deemed unreasonable, as it is more probable that its actual cost will fall short of that sum, than that it will exceed it. If the canal be extended from Pittsburg to the western entrance of the tunnel, before the tunnel be commenced, and the reservoirs and feeders be completed, the construction of the tunnel, and of the descending navigation from it to Cumberland, may be much facilitated and its cost thereby reduced. Such an operation might be as well effected in a single year as in a longer period ; and, within three years from the time of its completion, the entire canal might be constructed from Georgetown, in the District of Columbia, to Pittsburg, in Pennsylvania.

It does not appear to your committee that working shafts need be resorted to, or side drains provided for the first half mile at each extreme of the tunnel ; and, if the reservoirs and feeder on the western side of the tunnel were contemporaneously begun with the western extreme of the tunnel itself, the materials derived from its excavation being believed to be sand stone, might be beneficially applied to the dams of the reservoir, and the canal and locks descending from it to the west.

Relying much on the public confidence which will be imparted to this great enterprize by the co-operation of the United States in its execution, the committee indulge the hope, therefore, that it may be completed, throughout, in the period which they have allowed for the construction of its eastern section ; provided the United States shall grant the present prayer of the memorialists, and at an expense not exceeding ten millions of dollars.

No. 4.

The existence ascertained, of water-lime, on the margin of the river Potomac.

Hydraulic or water-lime, which, united in certain proportions with common sand, hardens under water, is deemed essential to the durable construction of locks, and, where sufficiently abundant, is substituted, to great advantage, in forming the sides and arches of culverts and aqueducts, for common lime, it will be seen, from the annexed correspondence, which was accompanied with samples of the lime in every stage of its preparation for use, to have been found, in inexhaustible quantities, on the Potomac, within one mile of Shepherdstown, or 73 miles of Georgetown, and 113 of Cumberland.

SHEPHERDSTOWN, January 14, 1828.

DEAR SIR : As a friend to internal improvement in general, and especially to the Chesapeake and Ohio canal, it gives me great pleasure to inform you, that I have discovered on the Potomac river, at the place where I am now engaged in building a large merchant mill, the

stone, in great abundance, which produces the water-lime. This fact I have reduced to a certainty, and am now able to prepare a mortar from this stone, which, in a short time, hardens in water, and becomes impervious.

Knowing the great interest you always have taken to accomplish so great national improvement, induces me to make this communication to you, which discovery, I hope, will be an additional inducement to stimulate the friends of the canal to further and greater exertion to complete a work, in the event of which so large a portion of our fellow-citizens will be benefitted. If you deem this communication of any importance, you are at liberty to use it as you please; and remain,

Very respectfully,

Your obedient servant,

HENRY BOTELER.

Hon. C. F. MERCER, *Washington.*

SHEPHERDSTOWN, *January 22, 1828.*

DEAR SIR: I received your favor, of the 19th instant, yesterday, and have lost no time in complying with your request, by sending you specimens of the water lime: one in its natural state, one burnt, and the powder after being calcined.

This stone is found in great abundance on my premises, immediately on the bank of the Potomac river, one mile below this place. It is found on the surface, and under the ground to a considerable depth. The hill, which appears to be entirely of this stone, is 200 feet high, and near half a mile around its base. It is of easy access, and can be quarried with more facility than the common lime-stone.

In preparing it for use, it requires only one-third of the time allotted to the burning of lime; consequently, it requires only a third of the wood necessary for calcining lime. You will perceive the stone to be harder than plaister of Paris: it therefore could not be broken and ground to a powder with the same ease, and for the same price, as the gypsum. Enclosed, you will also receive a small ball of the water lime, hardened to its present consistency in water: this ball was in a soft state when immersed, where it remained 48 hours to bring it to its present state of hardness. By mixing the powder to the consistency of mortar, and in that soft state immerse it, and if it hardens, it is the surest test of its being the genuine water-lime. We are waiting with anxiety to hear something about the canal; but I fear your state right colleagues, and anti-tariff gentlemen, will refuse us the loan or appropriation necessary for its completion. Any further communication on the subject of the water lime, will be thankfully received, and punctually attended to by

Your very humble servant,

HENRY BOTELER.

N. B. In the few experiments which I have made, the sand was omitted. Perhaps it would be an improvement.

Hon. C. F. MERCER, *Washington.*

SHEPHERDSTOWN, *January 29, 1828.*

DEAR SIR: In my last communication, which accompanied the water lime, I think I mentioned that I did not use any sand, which is the fact as relates to the experiments I have made, and the small ball I sent you hardened in water to the hardness in which you find it; but I have been informed since I wrote you, that clean sand is a necessary ingredient to strengthen the lime. I furnished Judge Geddes with a piece of the stone when making his survey down the river, who was pleased with the appearance of the stone, and to whom I refer you for further information on the subject.

Yours, very respectfully, &c.

HENRY BOTELER.

Hon. C. F. MERCER, *Washington.*

Extract of a letter from the same to same.

"SHEPHERDSTOWN, *February 4, 1882.*

"DEAR SIR: I received your favor of the 27th ultimo, on Saturday last, and am sorry my limited experience in the preparation of the water lime, puts it out of my power to answer your last inquiry satisfactorily. I had a few stones which I supposed to be the water lime, burnt on the top of a lime kiln, from which I tried, at different times, and found it to become hard under water. I also furnished Judge Geddes, the Engineer, with a piece of the stone, on his way down the river, to whom I refer you for a more particular account, as to its preparation, than I am able to give.

"From what little experience I have had in the preparation of this stone for use, I am of opinion that it could be furnished at the mill, where it is ground, for 37½ cents per bushel: this, however, will depend on the injury the mill stones will receive in grinding it. Enclosed you will receive another specimen, which, I think, of better quality than the other I sent you, and would advise you to wet it, and work it up, to the consistency of mortar, then roll it in little balls, and, after remaining two or three hours, immerse it in water, and if it hardens, I am told it is one of the surest tests of it being the genuine water lime. The quantity of stone on my premises, immediately on the bank of the river, is inexhaustible; at the same time, I am of opinion it will be found in many other places on the Potomac."

Extract of a letter from A. Lacock to the same.

CANAL OFFICE, SPRING DALE,

January 17, 1828.

DEAR SIR: Enclosed you will receive what I believe to be all the facts and information you wished for, in relation to the public work under my superintendence. If, however, you should find other facts, or more detailed information necessary, I should be glad to furnish you with every fact in my possession, or such other information as I can obtain.

This has been a very extraordinary season, so far; I have never experienced such a Winter in our latitude; we have recently had a flood in the Alleghany, as high as any that has occurred for the last thirty years. This is the fifth high flood we have had in our streams since you were here. The works, however, caught, as they were, in an unfinished state, have suffered much less, I find, than had been anticipated by every one. The dams upon the Kiskiminitas have received no additional injury since the first freshet, and we are furnished with a complete evidence of the permanency of such structures over our streams, by the recent trials we have had of them upon this river. This stream raised twenty feet in a few hours. You will receive specimens of our water lime, some burnt and ground, and some without burning. It can be had every where. The difference between water and other lime consists, principally, in grinding it, and this expense will be much lessened when proper machinery shall be constructed to effect this object.

I shall be glad to hear from you at all times, and am yours, &c.

A. LACOCK.

CHARLES FENTON MERCER, Esq.

The same lime has been found on the Susquehanna river, both above and below Harrisburg, in Pennsylvania. It is delivered in a condition for use, at all the locks on the Alleghany river, for 25 cents the bushel.

Its value may be estimated by the consideration, that, in the construction of the tunnel, only, of the Chesapeake and Ohio canal, its substitution for common lime is made by the United States' Engineers to enhance the cost of that work more than 200,000 dollars.

The scientific and able Engineer of the Board of Public Works of Virginia, advances the opinion, in a recent report on the navigation of James river, that, in consequence of the late discovery of hydraulic lime on that river, "a lock and dam improvement" of its navigation "would be made for from three to four hundred thousand dollars less; and a canal up to Covington, for, probably, 500,000 dollars less, than if the New York, instead of Virginia, hydraulic lime, was used." This lime," he adds, "was discovered near James river, at the nearest point of the lime-stone district, and within a short distance of the *Blue Ridge canal*"—a position, as the report remarks, corresponding with that of its discovery both on the Susquehanna and the Potomac rivers.

No. 5.

As the actual cost of the canals, which Pennsylvania is conducting to the base of the Alleghany, from the rivers Ohio and Susquehanna, by their respective branches, has been assumed as a standard of the probable cost of the corresponding portions of the Chesapeake and

Ohio Canal, so the future profit of that canal may be inferred from the actual profits of that by which New York has connected the Hudson with the Lakes.

The receipts, upon the Erie Canal, during the years 1826 and 1827, in which the entire canal has been in use, have, in round numbers, amounted to 687 and 786 thousand dollars, respectively. In the last annual report of the Canal Commissioners of New York, "the increase of receipts on the Erie Canal," in the last year, is stated to have been \$98,248 18. The original cost of the Erie and Champlain Canals is estimated, in that report, to have been \$7,519,995, exclusive of the sums applied to the extinguishment of the rights of the Western Inland Lock Navigation Company, and of the private damages paid, or yet due, to individuals. These last items, computed together at 443,000 dollars, make the total cost of both canals, in length 443 miles, somewhat less than eight millions of dollars. Deducting from this sum, for the cost of the Champlain Canal, and the amount paid the pre-existing company, one million of dollars, which is not far from the truth, and seven millions are left for the actual cost of the Erie Canal. Upon this sum, the average annual tolls, of the two last years, afford a gross revenue of more than 10 per cent. Deducting two per cent. for collecting and repairs, which, but for the imperfect structure of this work, would be at least one per cent. too much, and a nett revenue of 8 per ct. remains upon the capital invested in the canal, connecting Albany with Lake Erie; in length, 363 miles, with a lockage of 688 feet. That this canal, could, now, be constructed at 25 per cent. less than its original cost, and in a much more substantial and durable manner, is, it is believed, universally admitted; and the distinguished statesman, who is eminently entitled to be considered as its most active and efficient friend, in his late message to the Legislature of New York, has computed the cost of all similar works in the United States, exposed to no peculiar difficulties, at \$10,000 the mile. (See the end of this note.) The Champlain and Erie Canals, were contemporaneously constructed, at an expense exceeding \$17,200 the mile, without computing the whole amount of private damages.

A corresponding deduction from the actual cost of the Erie canal, and the expenses of its annual repairs, would extend its present nett income, to more than fifteen per cent, upon its actual value. And yet, this income is but a part, certainly not a moiety, probably not a fourth, of the revenue which this useful work must yield, at no distant day, since but a very inconsiderable part of this revenue is derived either from the commerce of the Lakes, or of the Hudson. The latter is, in truth, the outlet, rather than the inlet, of the trade of this canal: for, of its tonnage, which, in 1826, amounted to more than 300,000 tons, a part of 28,000, only, can be ascribed to foreign importation, while, of the total revenue of that year, amounting, as has been seen, to 687,000 dollars, but 27,000 dollars, and of the greater revenue of the last year, but 38,000 dollars, was collected at Black Rock and Buffalo, the ports of Lake Erie, and the river Niagara.

The Chesapeake and Ohio Canal will be, in length, 341½ miles, with a lockage of 3158 feet; and, including its tunnel, may possibly cost \$10,000,000. So far as that lockage is an impediment to the velocity of the moving boat, it will be more than made up by the diminished resistance encountered by the same boat, on a canal of broader surface, and deeper volume. Whether its extra cost will be balanced by sources of superior profit, remains to be ascertained. Till experience can determine this inquiry, the deductions of reason, by analogy, must supply its place. Such will be the purpose of the sequel of this note.

Considering these canals, without reference to the countries which they unite, as independent lines of communication, their length is very near the same, and the cheaper cost of the one operates, to a certain, and nearly ascertained extent, very greatly in its favor. The annual expenses, also, for gatekeepers and repairs, will be greater upon the canal of more elevated summit, on a supposition that they are constructed of materials equally good, and with equal skill.

Looking to the *country on either side of them*, the superiority of the Erie Canal ceases; for the eastern section of the Chesapeake and Ohio Canal, apart from the western, has a natural tributary navigation, capable of immediate use, exceeding five hundred miles, and extending, laterally, through some of the broadest, richest, and best cultivated limestone vallies in the United States; while, at an inconsiderable distance to the north of the New York Canal, a sheet of water, owned in part, and bordered, on one side, by a foreign and rival country, extends for a distance of 200 miles. Even to the South, although navigable lakes and rivers offer an incentive, to farther labor, to improve their navigation, and connect them with the Erie Canal, there is no natural, nor can any artificial navigation be constructed, comparable, in value, with that which the tributaries of the Potomac, and the Monongahela do, or cannot be made, by like exertion, to supply.

Looking from the *borders to the extremes* of these great works, or to the navigable waters and territories which they connect, a criterion has already been supplied, by experience, of the revenue which the Erie Canal derives from the great lakes, to the west, and the river Hudson, with its opulent and thriving emporium, to the east. The Chesapeake, with its various ports and harbors, certainly does not promise less than 28,000 tons, to the trade of that canal which shall connect it with the centre of Virginia, the bosom of the Alleghany, the interior of Maryland and Pennsylvania, and the numerous and populous States of the West; while these, with their already improved agriculture, constantly increasing numbers and rising arts, cannot fail to contribute more than 38,000 dollars to the tolls of the Chesapeake and Ohio Canal. The turnpike tolls now paid, or evaded in consequence of their magnitude, by the wagons that travel between the National Road and the markets of Baltimore and the District, are not short of that amount: and what it would be, if a continued canal were substituted for a road, not only from Cumber-

land, but Pittsburg, to those markets, may readily be conceived. The Atlantic may be regarded as the eastern termination of both canals : for the present, and for years to come, unprofitable inland seas, shortly to be common to both canals, bound the Erie Canal to the west, instead of the Ohio and the Mississippi, and two millions of people who look to those rivers as their natural channels of trade.

If, from the *amount* of the tolls of the Erie Canal, our attention be turned to the *particular subjects* on which they were levied in the last year, of which there is a public report, these anticipations will all be confirmed. It is to be regretted that no tabular or other return of the number or quantities of the various commodities which have contributed to the revenue of this canal, during the last year, has yet met the public eye. Many curious, and some very useful practical deductions would be supplied by so valuable a body of statistics. It is more than probable, however, that it would not greatly vary the inferences deducible from the experience of antecedent years. In the table of receipts, comprehended in the Canal Commissioners' report to the Legislature of New York, on the 18th February, 1827, Utica is the point, on the Erie Canal, at which the amount of its revenue is ascertained ; while the joint revenue of the Erie and Champlain Canals, is denoted by the receipts at the town of West Troy. Embraced in the last, are 50,000 tons of cord wood. In the Utica table, but little more than one-tenth of this tonnage appears. But it is not probable that this proportion of ten to one, in favor of the joint revenue derived to these canals from this article of consumption, truly denotes the relative proportion of this species of fuel, which passes West Troy from the two canals : for, of the tolls of the Champlain Canal, the sum of \$46,500, out of \$74,000, the total amount collected in the year 1826, was received at White Hall, upon Lake Champlain ; and but \$10,450 at Waterford, immediately above West Troy. The object of this particular comparison, is to render manifest, that, of the entire tonnage constituting the basis of the revenue of the Erie Canal, unmanufactured wood, in some form or other, or the almost rude produce of the forest, constitutes a very large proportion.

If the table of the commodities passing West Troy be relied on as a just measure of this proportion, then, of the descending trade of the Erie Canal, amounting in 1826, to 269,795 tons, as much as 150,226 tons, or more than a moiety was composed of sawed lumber, timber, shingles, staves, and cord wood ; to which might be added 7,681 tons of ashes : leaving the portion of the descending tonnage, composed of all other commodities, less than 112,000 tons.

Of this tonnage, flour, wheat, coarse grain, and provisions, furnished all but 30,000 tons ; and of the last residue, domestic distilled spirits, stone, bricks, and lime, supplied a full moiety.

Of the very small remainder, since the discovery of water lime, in abundant quantities, upon the eastern as well as western sections of the Chesapeake and Ohio Canal, there is but a single commodity which that canal may not be expected to supply. For salt (see the letter at the end of this note) will be furnished from the river Ohio,

or the Alleghany Canal, through the market of Pittsburg, or from other points still nearer the Atlantic, as from the line of the canal along the Youghiogeny, where it is now found, and very successfully manufactured.

In the tables which supply the materials of this analysis, hydraulic or water lime is not distinguished from common lime ; but adding, to both of these, salt and gypsum, and the total aggregate falls short of 8,000 tons.

Ale, beer, and cider are enumerated in these tables, but with many other items, and in quantities so inconsiderable, as not to merit more particular allusion in this inquiry.

From the preceding facts, and those noticed in the text of this report, the following deductions are inferable : That, along the canals of New York, no articles descended in the year 1826, that the Chesapeake and Ohio Canal will not certainly and abundantly supply, except gypsum ;

That, of the part of the ascending tonnage of the Erie canal, which is not, unequivocally, a return of that which has descended, only 28,000 tons consist of merchandise, or can possibly be ascribed to the import trade of the city of New York. That, in the same year, but 27,000 dollars, of a revenue of 687,000, was derived from the opposite extreme of the Erie Canal, or from the lakes ;

That, in neither the ascending nor descending tonnage, does there appear, below West Troy, or the junction of the Erie and Champlain Canals, any one of the following commodities, viz : coal, iron, marble, tan bark, or salted fish ; except, indeed, iron, and of that, not a pound of bar iron, or castings, and less than 1000 tons of pig iron ;

That, notwithstanding these deficiencies, the tolls of the Erie Canal, in 1826, amounted to a gross revenue of very near ten per cent. on its actual cost, computed at seven millions of dollars, or near twice the corrected estimate of the eastern section of the Chesapeake and Ohio Canal.

This inquiry might, and should be, for its definite and just conclusion, extended to the relative capacity, of the territories bordering on these canals, to supply the articles common to both, and to the probable extent of the future tonnage of those which are peculiar to each canal. Thus extended, it would involve an investigation of the extent and quality of the forests, soil, climate, mineral, vegetable, and animal productions of extensive regions.

Let it suffice to say, that, in none of these respects, will the more extended country, drained by the channel of the Potomac, suffer from a comparison with that of the more northern canal ; while the line of intercourse which it is calculated to furnish, between the tide of the Atlantic and the States of the west, is the shortest that can be found, in point of distance, and, if improved, in the mode proposed by a former report of the Committee, by far the shortest, in point of time.

It is confidently believed that upon the ascertained abundance, quality, and facility of reaching the coal of the Potomac, to say nothing of its iron, the subscribers to the stock of this canal might confidently

rely, for an ample return of income upon their invested capital. One other consideration should not be omitted : that the Potomac, between its Great Falls and Georgetown, commanding, at one place, in half a mile of a distance not exceeding in all fourteen, from tide water, a fall of more than seventy feet, and in twice that space at another, almost immediately at Georgetown, a fall of more than half that magnitude, supplies the cheapest means of manufacturing, on the line of its canal, every crude material that may be wafted on its surface.

Extract from Governor Clinton's late Message.

"The Erie and Champlain canals have cost between 20 and 30,000 dollars a mile, and this enormous expenditure will never occur again. All the mysteries of such operations are developed, and all the difficulties diminished, and it may now be confidently pronounced, that the maximum expense of any given canal, will not exceed ten thousand dollars a mile, unless it passes over high mountains, by locks, inclined planes, or deep cuttings, or under them, by extensive tunnels. The opposition to the extension of internal navigation is based upon an application of the same ratio of expenditure on the constructed to the contemplated canals ; but admitting, what is peremptorily denied, that the income from the former, does not exceed something more than seven per cent, yet it will even then be evident, that the state will gain two and a half per cent by the operation, as loans can be procured on her credit, at four and a half per cent."

In the 5th note of the Appendix, the actual cost of the New York canal, derived from the joint report of the Canal Commissioners, is stated, from authentic documents, to have been about 17,300 dollars the mile, exclusive of a sum due for private damages, which would not raise the average above 18,000 dollars, since, with the amount paid to the Inland Lock Navigation Company, it does not exceed \$ 1000 the mile of the cost of the canal. These two items of account are, however, blended in the Commissioners' report. One of them has no bearing on the cost of constructing the canals of New York.

Extract from the annual report of the Canal Commissioners of the State of New York, made to the Legislature, January 10th, 1828.

"An improvement on some of the locks has been made, and preparations are making to extend it to all the others, which will greatly facilitate the passage of boats. It consists in increasing the number of paddle gates, which can be so placed, as to fill and empty the lock, without injury to the boats on the canal, in half the time which has been hitherto required. The expense of this improvement will be small, and the advantage will be almost equal to doubling the number of the locks."

From the last report of the Board of Canal Commissioners, to the General Assembly of the State of Ohio, further evidence may be ad-

duced of the cost of canals. in the present circumstances of the United States, which, if it does not apply to the eastern section of the Chesapeake and Ohio Canal, indubitably does to the western. Peculiar difficulties occur, in various parts of the intended line of the Ohio Canal, in procuring suitable stone for locks which will not be felt to the same extent in any part of the Chesapeake and Ohio Canal. And the former has, between its portage summit and the Lake, or from Akron to the basin at Cleveland, forty-one locks, and three aqueducts, in a space of 37 miles, through which a boat descended on the 4th of July last, a period precisely two years from the commencement of the work. "The whole cost of the canal," say the commissioners, "from its junction with the Cayahoga river, at Cleveland, to the south end of the Licking summit level, estimated at the prices for which parts of it have been finished," "and the residue is going on," of a continued line of 194 miles, with four miles and 67 chains of navigable feeders, "will be found to differ little from \$8,960 the mile." The cost of the 139 miles 67 chains, of this portion of the line next to the Lake, will average, when completed, but 8,026 dollars the mile.

On the Miami Canal, from Cincinnati to the feeder, a line of 44 miles, the average cost per mile has been 10,408 dollars 40 cents. Of this division, the actual, has fallen short of the estimated, cost. Vid. Canal report of January 5th 1828.

CUMBERLAND, *November 11, 1827.*

CHARLES F. MERCER. Esq.

DEAR SIR: In compliance with your request, I have obtained from Mr. John Davis, the Superintendent of the paved road from this place to Hancock, a statement of the number of wagons which pass that road, and their tonnage, per each horse power, as you will see per his letter to me, herewith enclosed. I will here observe, that there are nearly or quite as many wagons which cross the mountain, and take the Virginia road, which leaves the United States' road five miles west of this place, as travel the paved road from this to Hancock; they cross the Potomac at Shepherdstown, or Harper's Ferry, on their way to Baltimore: and, from Baltimore, return, by the same route, to the west. They travel this route during the Summer and Fall months, when the roads are dry and firm, to avoid paying toll on the paved roads. The most of the wagons, from Baltimore to Pittsburgh, and from Pittsburgh to Baltimore, travel on the Chambersburg and Bedford road.

On the subject of coal, (we furnished Samuel H. Smith, Esq. of the District, with full, and, I believe, accurate information on the subject of our beds of coal in this county, and Hampshire county, Virginia,) the pits which are now opened, and from which we obtain our supply at this time, are situated from 8 to 10 miles west of this place, and near Frostburgh: and on and near the National Road, there are

7 pits now worked in that neighborhood, which are considered to be large bodies. The strata are from 7 to 9 feet thick, perpendicular; what their extent may be, horizontally, it is impossible to determine. Coal, in large beds, is found in every hill and ridge in that valley, lying between Dann's Mountain and Savage Mountain: they are situated from 4 to 6 miles apart, and running parallel for 30 or 40 miles, from northeast to southwest, in the immediate neighborhood of the mouth of Savage, and on George's creek, near western port. There are large beds, said to be from 15 to 20 feet thick, both in Virginia and Maryland, and immediately on the river hills.

On the subject of iron ore, I have but little information. The quantity of ore appears to be abundant: as to the quality, I am totally unacquainted. There are now erecting a furnace and forge at the mouth of Bear creek, on the Youghiogeny river, 10 miles above Smithfield, on the rout surveyed for the canal, by the way of Deep creek. These works will be in operation in 6 or 8 months. These banks of ore are said to be inexhaustible, and of superior quality.

I remain, with much respect, yours.

JOHN HOYE.

FLINTSTONE, November 12, 1827.

Mr. JOHN HOYE,

DEAR SIR: On my arrival home, on Saturday evening, I found your favor of the 8th instant. On the 22d October, I furnished Mr. Brent, of Hancock, an answer to similar inquiries; and, I presume, for the same person and object.

Herewith, you will receive the same statement: and as there is very little variation in any of the gates, respecting wagon travel, from Licking creek to Cumberland, the account taken from gate No. 3, at Sidling hill, will be sufficiently accurate.

From May 1, 1825, to May 1, 1826, was,

					Number.	
Narrow wheel wagons and 6 horses,	-	-	-	-	601	3,606
“ “ “ 5 “	-	-	-	-	1,221	6,105
“ “ “ 4 “	-	-	-	-	465	1,860
Broad wheel wagons and 6 horses,	-	-	-	-	34	204
“ “ “ 5 “	-	-	-	-	75	375
“ “ “ 4 “	-	-	-	-	38	152

12,302

From May 1, 1826, to May 1, 1827, viz:

Narrow wheel wagons and 6 horses,	-	-	-	-	630	3,780
“ “ “ 5 “	-	-	-	-	1,327	6,635
“ “ “ 4 “	-	-	-	-	427	1,808
Broad wheel wagons and 6 horses,	-	-	-	-	58	348
“ “ “ 5 “	-	-	-	-	100	500
“ “ “ 4 “	-	-	-	-	51	204

13,275

Since the 1st January last, the account of wagon travel has been kept, to distinguish it, both easterly and westerly ; and, from January 1st to October 1st, 9 months' travel, is as follows :

Easterly.

Narrow wheel wagons,	6 horses,	-	-	302
"	"	5	"	521
"	"	4	"	167
Broad wheel wagons,	6 horses,	-	-	33
"	"	5	"	49
"	"	4	"	21

Westerly.

Narrow wheel wagons,	6 horses,	-	-	277
"	"	5	"	554
"	"	4	"	215
Broad wheel wagons,	6 horses,	-	-	24
"	"	5	"	53
"	"	4	"	19

I have no data of tonnage ; but, I suppose about 700 lbs. per horse to be a fair average of the weight of the loads generally carried on this road. The rate of tolls is 12½ cents per horse, in narrow wheel wagons, every 10 miles : broad wheel wagons, half the above.

I am, sir, very respectfully,

Your obedient servant,

JOHN DAVIS.

Letter from John B. Miles, Esq. Assistant Engineer.

KISKIMINITAS SALINE, December 17, 1827.

DEAR SIR : Agreeably to your request, I furnish you with a narrative of facts relative to the manufacturing of salt on this river. Their commencement was in 1820, and, at present, there are twenty in operation ; and the quantity of salt obtained from each mill, annually, is 18,000 bushels. The mills are now rented to individuals ; the proprietor paying the renter 90 cents per barrel ; the barrel being deducted, (which costs 25 cents,) leaves 13 cents per bushel. The profit to the renter is at least 500 dollars.

There is now commenced, and the proprietor (Mr. Boggs) intends finishing next Summer, a shaft six feet in diameter, to be 500 feet in depth ; which, by a true analysis, will yield a sufficiency of water, to make 1,000 bushels per diem. or 300,000 per annum, (allowing 300 days in the year for actual operation,) added to the quantity now manufactured, will be 660,000 bushels, yearly. I have omitted giving you the amount of capital invested in each mill—it is 2,000 dollars ; and the amount that is supposed will be invested in the shaft, is 6,000

dollars. If you wish for any other information respecting the manufacturing of salt, let me know your request, and, if in my power, I will furnish it with pleasure.

Respectfully yours, &c.

JOHN B. MILES.

Hon. C. F. MERCER.

No. 6.

January 8, 1828.

DEAR SIR: I have the pleasure, in compliance with your request, to enclose the following statements:

1. Private Subscriptions to the Stock of the Chesapeake and Ohio Canal, received at the Bank of Washington, amounting to - - - - \$ 114,800
 2. Do. received at the Office of the Bank of the United States, at Washington, amounting to - - - 111.200
- \$ 226.000

I am, with great respect,

SAMUEL H. SMITH.

Hon. C. F. MERCER.

No. 1.

SUBSCRIPTIONS to the Chesapeake and Ohio Canal, by persons residing at Washington, in the District of Columbia, received at the Bank of Washington.

Names of Subscribers, and Number of Shares.

Matthew St. Clair Clarke	- 5	Daniel D. Arden	- - 10
Jonathan Prout	- - 10	John H. Murray	- - 10
Benjamin Burch	- - 10	Peter Lenox	- - 20
George Bomford	- - 50	Abraham B. Waller	- - 10
Ingle, Lindsley, & Ingle	- 25	Walter Clarke	- - 5
William Hewitt	- - 10	Robert Leckie	- - 10
Hezekiah Langley	- - 10	George Phillips	- - 10
Edward G. Handy	- - 10	John H. Baker	- - 10
John Coyle	- - 10	William Deming	- - 10
William J. McCormick	- 5	Joseph Gales, jun.	- - 50
Edward Simms	- - 20	William A. Bradley	- - 100
William Archer	- - 20	Thomas Cookendorfer	- 10
John F. Webb	- - 5	Thomas Lyndall	- - 20

SUBSCRIPTIONS—Continued.

Names of Subscribers, and Number of Shares.

William Easby	-	-	20	Francis Masi & Co.	-	-	5
Charles S. Fowler	-	-	10	Samuel S. Hamilton	-	-	5
George W. Dawson	-	-	5	I. L. Skinner	-	-	5
George Adams	-	-	5	Samuel Bacon	-	-	10
Samuel H. Smith	-	-	20	John R. Nourse	-	-	5
Roger C. Weightman	-	-	20	William Cooper, jun.	-	-	5
James Owner, jun.	-	-	5	Edward De Krafft	-	-	10
John Purdy	-	-	5	John Stettinius	-	-	5
Nicholas L. Queen	-	-	10	Tucker & Thompson	-	-	10
John Davis, of Abel	-	-	10	Patrick Crowley	-	-	5
Anthony Preston	-	-	5	Thomas Munroe	-	-	20
John G. McDonald	-	-	5	W. D. Addison, jun.	-	-	5
Henry T. Weightman	-	-	5	William W. Seaton	-	-	5
Wm. A. Smallwood	-	-	10	William Rhodes	-	-	5
Mathias Jeffers	-	-	5	Nathan Smith	-	-	5
Ignatius F. Young	-	-	5	William Prout	-	-	10
Matthew Wright	-	-	5	John McCutchen	-	-	5
Timothy Winn	-	-	10	George Parker & Co.	-	-	5
Thomas Gibson	-	-	5	Jonathan Phillips	-	-	5
Frederick May	-	-	5	W. Walters	-	-	5
John Coyle, jun.	-	-	5	Joseph Costigan	-	-	5
Robert Brown	-	-	5	Richard Wallack	-	-	5
Samuel Burch	-	-	10	Andrew Way	-	-	5
George Watterston	-	-	5	Mary Matilda Way	-	-	5
Cary Selden	-	-	5	George B. Way	-	-	5
Thomas B. Brown	-	-	5	Andrew J. H. Way	-	-	5
Stephen R. Kean	-	-	5	Andrew Coyle	-	-	5
Nathaniel P. Poor	-	-	5	Jno. Withers (Alexandria)	-	-	10
A. Van Coble	-	-	5	Wm. Warren (Philada.)	-	-	5
Anthony Holmead, jun.	-	-	5	William Gunton	-	-	30
James H. Lowry	-	-	5	Griffith Coombe	-	-	10
George Jacobs	-	-	5	John Marshall, Richmond, Va.	-	-	5
Abraham Bradley	-	-	20				

Number of Shares of five and over	-	-	-	950
Do. under five	-	-	-	198

Whole number of Shares subscribed at Bank of Washington 1,148

No. 2.

January 4, 1828.

DEAR SIR: I send, herewith, a list of subscriptions to the Chesapeake and Ohio Canal Company, taken at this office.

Very respectfully, your obedient servant,

RD. SMITH, *Cashier*
Office Bk. U. S. Washington.

S. H. SMITH, Esq.

SUBSCRIPTIONS to the capital stock of the Chesapeake and Ohio Canal Company, taken at the Office of the Bank of the United States, in Washington City.

Names of Subscribers, and Number of Shares.

Cornelius McLean	-	-	20	C. W. Boteler	-	-	5
Martin Slaughter (Fairfax,				John Barcroft	-	-	20
Culpeper co. Va.)	-	-	5	Gideon Beall	-	-	5
John P. Davis	-	-	5	J. Gideon, jr.	-	-	10
Archibald Cheshire	-	-	10	Way & Gideon	-	-	10
Richard S. Cox	-	-	20	Reuben Burdine	-	-	5
John A. Smith	-	-	20	Master Carpenters' Benevo-			
Thomas Taylor	-	-	5	lent Society, C. McLean,			
William Brent	-	-	10	President	-	-	5
Henry Naylor	-	-	5	G. C. Grammer	-	-	5
Jesse Brown	-	-	10	George King, of Charles	-	-	10
George Sweeney	-	-	10	Michael Nourse	-	-	5
R. S. Briscoe	-	-	20	N. W. Fales	-	-	5
John D. Barclay	-	-	5	John Coburn	-	-	5
John Kennedy	-	-	5	W. W. Billing	-	-	5
Lucy Ann Jessup	-	-	5	G. E. Dyson	-	-	5
Mary S. Jessup	-	-	5	J. A. Kennedy	-	-	5
C. & M. Hines	-	-	20	Philip Mauro	-	-	10
E. J. Middleton	-	-	5	Thomas Wetherald	-	-	5
F. A. Wagler	-	-	5	F. X. Kennedy	-	-	5
Rt. Barry, jr. (Georgetown)	-	-	5	William Otis	-	-	50
Nathan Eaton	-	-	5	Susan Graham	-	-	10
Nicholas Harper	-	-	5	Joseph Pearson, (Dist. Col.)	-	-	10
William Brown	-	-	5	Andrew T. McCormick	-	-	10
Philip Hines	-	-	5	John Tayloe	-	-	50
John Eschback	-	-	5	Alexander McDonald	-	-	5
James Moore	-	-	5	John Brannan	-	-	5
Duff Green	-	-	5	Thomas Bates	-	-	5
John Sessford	-	-	5	Thomas W. Pairo	-	-	20
William James	-	-	5	Henry Hunt	-	-	20

SUBSCRIPTIONS—Continued.

Names of Subscribers and Number of Shares.

B. O. Tayloe, (K. G. co. Va.)	5	N. P. Causin	-	-	10
Walter Jones	-	James McClery	-	-	10
William Ward	-	James Larned	-	-	5
James Birth	-	Frederick Keller	-	-	10
Jos. Nourse & C. J. Nourse	10	Nelson Davidson	-	-	5
Richard Harrison	-	Christian Eckloff	-	-	5
George Graham	-	Pishey Thompson	-	-	10
John McClelland	-	Ezekiel Young	-	-	5
S. Pleasanton	-	Samuel Ditty	-	-	5
William G. Ousely	-	William Duncan	-	-	5
F. G. Blackford	-	William J. Stone	-	-	10
Joseph Kent, (P. G. co. Md.)	10	C. S. Coltman	-	-	10
Mary M. Forrest	-	John Waters	-	-	5
Roger Jones	-	Patrick Delany	-	-	5
T. A. C. Jones, (U. S. Navy)	5	James M. Staughton	-	-	5
Nathaniel Jewett	-	George Milburn	-	-	5
Tench Ringgold	-	William Drake	-	-	5
Samuel Carusi	-	Clagett & Washington	-	-	10
B. L. Lear	-	Josiah Bosworth	-	-	5
John P. Van Ness	-	John McDuel	-	-	5
Peter Force	-	George McDuel	-	-	5
James Thompson	-	John France	-	-	10
E. Fitzgerald, (U. S. Navy)	10	R. H. Williamson	-	-	5
Nathan Towson	-	P. G. Howle	-	-	5
Henry Randall	-	Samuel Holtzman	-	-	5
George Beal, (U. S. Navy)	5	Andrew Noerr	-	-	5
James Walker	-	Ann Brodeau	-	-	5
Ann Kedglie	-	Anna Maria Thornton	-	-	5
J. N. Hambleton (U. S. Navy)	5	David Appler	-	-	5
James Kearney	-	William Dowling	-	-	5
<hr/>					
Number of Shares of five and over	-	-	-	-	970
Do. under five	-	-	-	-	142
<hr/>					
Whole number of Shares subscribed at Bank of U. States					1,112

January 9th, 1828.

DEAR SIR : I hand you, enclosed, a list of subscriptions to the stock of the Chesapeake and Ohio Canal Company, made on the books opened at this place. I am personally acquainted with all the sub-

scribers, except a *few* of the smaller only, and have no hesitation in saying that I believe they may be calculated on for punctuality.

Respectfully and truly, dear sir,

Your obedient servant,

C. SMITH.

We calculate on about 100,000 dollars in Virginia, Maryland, and Pennsylvania. Lists will be ordered from the different places, but some time may elapse before they come to hand.

C. S.

SUBSCRIPTIONS to the capital stock of the Chesapeake and Ohio Canal Company, opened at Georgetown, D. C. on the first day of October, 1827.

Names of Subscribers, and Number of Shares.

Corporation of Georgetown, by John Cox, Mayor, for E. section - - - 2,500	Jeremiah Orme - - - 5
Thomas Fairfax, of Alexan- dria, by his Attorney, C. Smith - - - 500	Richard Davis - - - 12
Estate of Henry Foxall, by the Trustees - - - 100	Geo. A. Adams - - - 5
David English - - - 100	A. H. Boucher - - - 5
Ld. Mackall - - - 100	Robt. White - - - 10
W. Smith - - - 100	John Adams, Jr. - - - 5
Walter and Clement Smith - 200	Henry Addison - - - 10
Charles King - - - 40	J. Carter, Jr. - - - 10
J. Mason - - - 70	John White - - - 10
J. Mason, in Potomac Co. stock, \$3.111 11	Tho. Corcoran - - - 20
Henry Baker - - - 6	James Corcoran - - - 10
H. B. Robertson - - - 5	John Myers - - - 7
Jas. Brooks - - - 5	James Wharton - - - 5
N. W. Worthington - - - 5	Raphael Semmes - - - 20
Clement Cox - - - 10	J. N. Fearson - - - 5
John Lutz - - - 10	George B. Magruder - - - 10
Anthony McElroy - - - 5	Joel Cruttenden - - - 50
Peter W. Magruder - - - 5	N. M. Marden - - - 10
Joseph Reynolds - - - 10	Joseph Libby - - - 20
Brook Mackall - - - 10	John Dickson - - - 5
John Little - - - 5	T. Nixdorff - - - 10
J. Riley - - - 5	T. Turner - - - 10
	W. Hayman - - - 20
	Joseph Arney - - - 5
	C. E. Eckle - - - 5
	Thomas Orme - - - 5
	Ninian Beall - - - 5
	William Jewell - - - 25

SUBSCRIPTIONS—Continued.

Names of Subscribers, and Number of Shares.

Lewis Smith	-	5	L. G. Davidson, payable in		
Francis King	-	10	Potomac Co. stock \$1,333 33		
C. Lyons	-	5	John Abbott	-	10
John Marbury	-	10	Henry McPherson	-	5
John Waters	-	5	James D. Cobb	-	15
George Lowry	-	10	W. T. W. Tone	-	50
John Eppes	-	5	Mrs. Tone Wilson	-	30
Geo. Mahorney	-	5	M. Addler	-	5
D. English, Jr.	-	10	C. Worthington, payable		
John H. King	-	5	in Potomac Co. stock \$444 44		
Jesse Lipscomb	-	5	John Baker	-	6
A. T. Pickerell	-	15	John Holtzman	-	5
Ann Pickerell	-	0	O. M. Linthicum	-	10
H. W. Tilley	-	5	E. M. Linthicum	-	5
Charles Dean	-	10	E. M. Mosher	-	10
James Dunlop	-	5	John Hoover	-	10
	-	5	G. W. Haller	-	5
John Lutz	-	10	Alexander Mackay	-	10
Tho. Jackson	-	5	H. C. Matthews	-	10
Tho. H. Beall	-	5	T. G. Waters	-	5
Rob. Barnard	-	6	Matthew Heizinga Messchart,		
Peter O'Donoghue	-	5	Philadelphia, by Jas. Da-		
Jas. Brooks	-	5	vidson, Att'y, payable in		
H. B. Robertson	-	5	Potomac Co. stock for £500 st.		
S. E. Scott, by C. Smith, At.	20		Henry Warring, payable in		
Benjn. S. Bohrer	-	5	Potomac Co. stock, £100 st.		
John S. Haw	-	10	Geo. Suckley, N. Y. payable		
John Kurtz	-	5	in debt of Potomac Compa-		
W. Smoot	-	5	ny, \$4,000, with interest		
Robt. Read	-	10	from 24th Nov. 1823.		
Robt. McGill	-	20	Samuel McKenney	-	5
J. W. Baker	-	10	Thomas Peter	-	10
Saml. B. Chew	-	5	James Williams	-	5
S. T. Fearson	-	10	R. Cruikshank	-	5
Brook Mackall	-	10	James Belt	-	5
	-	5	Wm. S. Allison	-	5
Anthony Smith	-	5	Sarah Tayloe, Washington,		
James Kennedy	-	5	by B. O. Tayloe, Attorney,		
Tho. Cissel	-	5	payable in Potomac Com-		
Isaac Bartlett	-	5	pany stock, for £200 ster.		
Am. Laub	-	5	W. C. Atwater	-	5
L. G. Davidson	-	40	R. Woodward	-	5
C. Worthington	-	5	Richd. Osborn	-	10

SUBSCRIPTIONS—Continued.

Names of Subscribers, and Number of Shares.

Eliza P. Custis, payable in stock of the Potomac Co. for £100 sterling, by J. Mason, Jr. Attorney	-	5	Potomac Co. stock for £100 st.		
Philip T. Berry	-	10	Allen Scott	-	6
W. G. Ridgely	-	5	William Marbury	-	10
Elizabeth Dunlop, by Jas. Dunlop, her Atty. £300 sterling, payable in stock of the Potomac Company.			John Laird. £1,800 sterling, payable in Potomac Co. stock.		
David English	-	6	John Laird	-	20
Wm. Howard. Baltimore	-	5	Saml. Moxley	-	5
Benjamin Homans	-	5	Thos. F. Semmes	-	5
A. M. Rose	-	5	Rob. Brook	-	5
A. M. Rose	-	5	Wm. Good	-	10
Richard Johns, payable in			J. D. Scott	-	5
			W. Smoot	-	5
			G. C. Washington, for £100 sterling, payable in old Potomac Canal stock.		

[In this list, all subscriptions for less than five shares are omitted; which, if added to the foregoing, would make the total number of shares subscribed for, amount to four thousand six hundred and seventy-three, exclusive of the Potomac stock, but including the 2500 shares of the Corporation.]

ALEXANDRIA, January 9th, 1828.

DEAR SIR: I have the pleasure to enclose the return of the subscription of Alexandria to the Chesapeake and Ohio Canal, up to this date, in a shape which, I presume, will be quite satisfactory, and remain with great regard, dear sir,

Your ob't. ser'vt.

A. C. CAZENOVE.

HON. CHARLES F. MERCER,

Chairman of the Committee Roads and Canals, Washington.

A copy of the Subscriptions to the Capital Stock of the Chesapeake and Ohio Canal Company, made at the Bank of Alexandria, in the Town of Alexandria, on, and subsequently to, the first day of October, 1827; pursuant to due notice of the time and place, given by the Commissioners appointed by the Executives of Virginia and Maryland, and the President of the United States, respectively, and under the management of the President and Cashier of said Bank, duly appointed by the said Commissioners to receive subscriptions, by authority, and pursuant to the directions of the Act of the General Assembly of Virginia, incorporating the said Chesapeake and Ohio Canal Company, and the several Statutes confirming the same.

Names of Subscribers.	Residence.	Num. of Shares	Paid, 1st Instal.
Anthony Charles Cazenove,	Alexandria,	5	\$ 5
A. C. Cazenove & Co.	do	5	5
Bushrod Washington, -	Mount Vernon	50	50
Humphrey Peake, -	Alexandria,	10	10
William A. Williams, -	do	5	5
Thomas Davy, -	do	5	5
Edward Sheehy, -	do	5	5
John Rumney, -	do	1	1
Josiah H. Davis, -	do	10	10
Robert Jamieson, -	do	5	5
George H. Smoot, -	do	3	3
James Irwin, -	do	5	5
William Page, -	do	1	1
John Gemeny, -	do	3	3
Kerr and Fitzhugh, -	do	5	5
Robert H. Miller, -	do	5	5
Jonathan Butcher, -	do	5	5
Samuel Miller, -	do	5	5
Samuel L. Janney, -	do	5	5
Samuel Janney, -	do	5	5
John W. Massie, -	do	5	5
Benjamin H. Lambert,	do	1	1
Richard Rock, -	do	5	5
John D. Vowell, -	do	5	5
William C. Gardner, -	do	5	5
The Common Council of Alexandria, by John C. Vowell, President thereof, agreeably to the law on that subject,	do	} 2,500	
William H. Miller, -	Alexandria,		10
Thomas P. Coleman, -	do	5	5
James L. M'Kenna -	Virginia,	5	5
		2,684	\$ 184

True copy, certified by us, this 9th day of January, 1828.

JONAH THOMPSON, Prest. &c.

J. L. M'KENNA, Cashier, &c.

Agents of the Commissioners.

A copy of the Subscriptions to the Capital Stock of the Chesapeake and Ohio Canal Company, made at the Bank of Alexandria, as above, but in the Stock of the Potomac Company, as prescribed by law.

Names of Subscribers.	Residence.	Sums subscribed.
Joseph Janney, jr. for self and Phinehas Janney, executors of John Janney, deceased, - - - - -	Alexandria.	\$ 888 88
J. B. Ladd, - - - - -	do	888 88
Anthony C. Cazenove, - - - - -	do	444 44
Thomas Vowell, - - - - -	do	4,888 88
James Keith, - - - - -	Virginia,	4,444 44
James Keith, executor of James Keith, deceased, - - - - -	do	1,333 33
Jonah Thompson, - - - - -	Alexandria,	444 44
Anthony Charles Cazenove, in trust for Peter Stitnitski's heirs, - - -	do	6,222 16
Anthony Charles Cazenove, in trust for Nicholas and Jacob Van Staphorst and Hubbard, or those holding under them,	do	17,333 16
Thomson F. Mason, devisee of Thomson Mason, deceased, - - - - -	do	2,222 20
Mordecai Miller, - - - - -	do	444 44
		<hr/> \$ 39,555 25 <hr/>

True copy, certified by us, this 9th January, 1828.

JONAH THOMPSON, Prest. &c. } *Agents of the Commissioners.*
J. L. M'KENNA, Cashier, &c. }

GENERAL SUMMARY.

	Shares.
Subscription by the Corporation of Washington	10,000
Georgetown	2,500
Alexandria	2,500
Do. by individuals in Washington	2,260
Georgetown	2,173
Alexandria	184
<hr/>	
Total number of shares subscribed within the District of Columbia	19,617
Supposed amount of subscriptions in the State of Pennsylvania, Maryland, and Virginia	1,383
<hr/>	
	21,000

Total subscription exclusive of that of the State of Maryland	21,000
Conditional subscription by the State of Maryland	- 5,000
Value of total subscription	- - - - <u>\$2,600,000</u>

No. 7.

The following act should have been included in the appendix of the preceding report.

CHAPTER 63.—An act giving the assent of this State to an act to amend the act incorporating the Chesapeake and Ohio Canal Company, as passed by the State of Maryland. [Passed February 26th, 1827.]

Whereas it is represented that the General Assembly of the Commonwealth of Maryland, hath passed, at their present session, an act entitled, “an act to amend the act incorporating the Chesapeake and Ohio Canal Company,” in the words following, to wit:

“1. *Be it enacted by the General Assembly of Maryland, That the act entitled. “an act incorporating the Chesapeake and Ohio Canal Company,” passed by the General Assembly of Virginia, at the December session, eighteen hundred and twenty-three, which has already received the assent of the State of Maryland, and of the Congress of the United States, as well as of the Potomac Company, shall be, and the same is hereby, amended, in the manner hereinafter provided, on condition that this act receive, in like manner, the assent of the necessary parties thereto.*

“2. *And be it enacted, That the Chesapeake and Ohio Canal Company shall have power to terminate the eastern section of the said canal at or near the town of Cumberland, on the river Potomac, and thence to extend the western section thereof, in any direction that may be deemed expedient, by any other route, as well as that prescribed in the act aforesaid, towards Pittsburg, on the river Ohio, and in extending the same in any direction across the dividing ridge, which separates the eastern and western waters, to substitute for a tunnel and numerous locks, on such part of the route, inclined planes and railways, or any other artificial communication or roads; and, in the event that the western section of the Chesapeake and Ohio Canal shall leave the valley of the Potomac river, at any point below the Coal Banks, at or near the mouth of Savage, on the north branch thereof, the company shall have the power in like manner to extend a branch from the main canal to the said Coal Banks, at or above the mouth of Savage, and to cause such branch to be constructed of such dimensions, as their views of their own and the public interest may warrant; and for the construction of the same, shall have and enjoy the same rights, privileges and immunities, under the same restraints and conditions, in all respects, as they are entitled to, in relation to the main Chesapeake and Ohio Canal.*

"3. *And be it enacted*, That nothing in this act contained shall be held to discharge the said company from a compliance with each and every of the conditions of the original act, except so far as the same are expressly altered by the provisions of this act.

"4. *And be it enacted*, That this act shall commence and be in force as soon as it shall have received the assent of the Legislature of Virginia, of the Congress of the United States, and of the Potomac Company."

1. *Be it therefore enacted by the General Assembly of this Commonwealth*, That the assent of this Legislature, in and to the amendment to the act incorporating the Chesapeake and Ohio Canal," as contained in the foregoing act of the General Assembly of Maryland, is hereby as fully and completely given, as if the said amendatory act had been passed by this present General Assembly.

2. This act shall be in force from the passing thereof.

CHESAPEAKE AND OHIO CANAL.

[Additional Appendix to be annexed to Report No. 141.]

The Committee on Roads and Canals report :

That they have sought to obtain all the information which the present experience of the United States could supply, of the probable cost of constructing those internal improvements to which Congress might be invited to extend the application of the national revenue. In this spirit, they now beg leave to add to the Appendix of their supplementary report on the memorial of the Central Committee of the Chesapeake and Ohio Canal Convention, and of the Commissioners appointed to open a subscription to the stock of that canal, the accompanying letter and tables, illustrative of the cost of various canals executed, or in progress in the United States ; some farther extracts from the voluminous reports recently submitted to the General Assembly, by the Canal Commissioners of Pennsylvania, and the report of the United States' Board of Engineers to the Department of War, of the 5th of November, 1823 ; which is calculated to obviate some of the objections to canals surmounting great elevations, to demonstrate the utility of reservoirs, and to shed additional light upon the separate cost of several species of work involved in the structure of canals.

The committee incorporate among these materials, a copy received since their last report, of an act of the General Assembly of Virginia, of the 26th of February, 1828, assenting to an act of the State of Maryland, further to amend the act incorporating the Chesapeake and Ohio Canal Company.

CINCINNATI, February 20, 1828.

JOHN WOODS, Esq.

House of Representatives, Washington :

DEAR SIR : I have but just reached home, having been absent since the last of November, which will account for the delay in replying to your letter of the 25th ultimo, requesting, in behalf of the Committee on Roads and Canals in Congress, information in relation to the cost of constructing canals, &c.

The blank form which you have enclosed, varies so materially from the arrangement of the different kinds of work, and of the prices for performing it, which has been adopted in the contracts for the construction of the Ohio and Miami canals, that I have not used it ; believing that the cost of the different items of work on these two canals, (so far as they are completed, or are progressing,) might be more satisfactorily shown, by stating each item in general terms upon the principles of our contracts, with such illustrations of the particular circumstances and plans, as may be necessary to give the information requested.

Excavation of Earth—No distinction, as to price, is made in our contracts between the different kinds of earth. The section to be contracted is staked out, showing the depth of cutting at each station of three chains. Test pits are occasionally sunk to *bottom of canal*, to exhibit the character of the earth to be excavated. The price per cubic yard bid, refers to all kinds of earth which may occur in the section contracted for, together with all loose stones or coarse gravel less in size than two cubic feet. It will be found, in practical operations, to be fraught with much difficulty, to attempt, in the contracts, to distinguish, as to prices, between the almost innumerable varieties of earth excavation: endless difficulty with the contractors would be the result. The excavation on the Miami canal, and that part of the Ohio canal now under contract south of the forks of the Muskingum river, has presented mostly yellow clay, coarse gravel, sand, and loam. The prices, up to 8 to 10 feet depth of cutting, have ranged between *six* and *eight* cents per cubic yard. In a few instances, *nine* cents has been paid, when hard excavation has been anticipated. Deep cutting (from 10 to 34 feet,) averaging 12 feet, and 22 feet depth, is under contract at 11 to 15 cents per cubic yard for earth.

Rock Excavation—On the Miami canal, the rock excavation has, in all cases, been in *blue limestone*, lying in horizontal strata of six to eight inches in thickness: the cost has been for excavating that which has been estimated as *solid rock*, generally, seventy-five cents; and for *detached rock*, measuring two cubic feet and upwards, twenty-five cents per cubic yard. On the Ohio canal, (the part above referred to,) the rock is, in most cases, a *coarse sandstone*. Its excavation has cost, for *solid rock*, 40 to 62½: and for *detached rock*, measuring two cubic feet and upwards, 18 to 25 cents per cubic yard.

Embankment—On either canal, the embankment has cost generally from *nine to eleven cents* per cubic yard, measured in the bank, making reasonable allowance for the shrinkage. At the time of making the contracts, the situation for procuring the earth is pointed out to the bidders, and produces its effect upon the price bid. In most cases, the earth has been obtained in the immediate vicinity of the bank to be made. Embankments on the Miami canal, from 20 to 56 feet in height, have been made for eleven cents, except in one instance, in which 13½ cents was paid for finishing one of the heaviest banks, which had been abandoned by the original contractor. The embankment at the reservoir, or the Licking summit of the Ohio canal, which is upwards of four miles in length, and, in height, rises from nothing to 18 feet, was built for 11½ cents per cubic yard. The material is mostly clay. Single embankments, where the canal is located at the foot of a hill, and the earth thrown off from the side of the hill, are made for 8 to 9 cents per yard.

Locks per perch of 16½ cubic feet—The cost of masonry depends so much upon the quality of the stone, and the cost of obtaining it, that no general rule will apply to particular cases. The stone of the Miami country (limestone) is expensive to cut, is quarried at considerable cost, and, for the locks on this line of canal, has been transported mostly

from two to six miles, but, in some instances, particular stone has been transported by land 18 to 28 miles. Some has been brought down the Ohio river 90 miles, and then transported 10 miles by land. The 12 locks on this canal which are completed, were built for about \$4 per perch, where the stone was obtained within an average distance of four miles. Where the stone was transported a greater distance, the extra transportation was paid in addition. The 10 locks on the upper part of this line, which are in progress, but not completed, are under contract to be built at from \$3 75 to \$4 12½ per perch, without any allowance for transportation. The stone is procured within a distance of six miles generally. On the Ohio canal, (between Licking summit and the forks of the Muskingum,) 22 locks are under contract at from \$2 to \$2 75 per perch : average, \$2 31. The stone is a *grey sandstone*, easily wrought, and is obtained very conveniently. In some instances, the quarries are situated in the immediate vicinity of the site for the lock ; in others, it is transported from two to four miles. Four of these locks are already constructed, and it is not doubted that they all will be built at the contract prices in the course of the ensuing season. The price per perch, in all cases, covers the cost of foundation, gates, and every fixture necessary to complete a lock for use. The excavation of the pit, and the puddling and embankment around the lock, are separate charges. Lock pit excavation is generally done for 12 to 15 cents per yard, and the puddling and embanking at about the same price per yard.

Culverts—Common culverts on the Miami canal have been built of rough limestone at from \$2 to \$2 25 per perch. Large arches, where the stone is laid in range work in the wings and parapet walls, and in the arch, every stone reaches through ; and the courses in range, and well grouted, are building at \$2 50, \$2 75, and \$3 50 per perch, varying with the expense of procuring stone, and the style of the work. On the Ohio canal, small culverts, with 14 to 15 inch rings, every stone cut to a pattern, (the stone being very friable sandstone,) are built for \$2 75 to \$3 per perch. Large arches, with rings 18 to 21 inches, stone cut to pattern, are built at from \$2 to \$2 75 per perch.

Aqueducts with wooden Trunks—The abutments and piers (on the Miami line,) of coarse limestone, laid rough, cost from \$1 75 to \$2 25 per perch. The trunks per foot run, (27 to 30 feet wide,) \$7. On the Ohio canal, abutments and piers, built with cut sandstone, laid in range, \$1 75 per perch : the trunks (18 to 20 feet wide) about \$5 per foot run. The prices of these works are very materially affected by the situation and quality of the materials.

Foundations of Aqueducts, Arches, &c.—This is an item in the construction of canals, which conforms to no rule or general principles as to cost. The engineer must pursue the subject until he is satisfied that a safe foundation is secured. Our late contracts provide for the excavation necessary to secure a foundation at a stipulated price per cubic yard, which covers the cost of bailing, pumping, &c. : 12½ to 25 cents per yard, in most cases, will pay. In some cases, however,

the cost will be much greater. The expense of foundations depends upon too many contingent circumstances to be estimated under any general rule. In addition, the excavation of the pits, which depends much upon the particular circumstances of the site, the items of timber for platform or flooring, and piles, either for bearing or guard piles, depend entirely, as to cost, upon the peculiarities of the site.

Road Bridges—The cost, for the framing, is \$100 to \$120. The embankments are paid for per yard, as in other cases of embankment. On the canals in this State, abutments of stone are not used. A simple trussel is considered preferable to stone.

Dry Walls—are laid up, with rough limestone, at \$1 60 to \$1 75 per perch, depending very much, however, as in other cases of masonry, upon the situation of the stone quarries.

Slope Walls—These have been built in several cases, and are building, for the protection of the canal banks from the action of the rain. They are mostly built by throwing loose stone at the base of the bank in the stream, and forming a base for the wall about five feet in width, which is continued up the slope of the bank to the highest range of the floods, terminating one foot in the truss. The stone is thrown in loosely, and suffered to assume such slope as will sustain the upper part of the wall or protection. The cost of such wall, with us, is about 75 cents per superficial yard, depending upon the facility of procuring stone. In some instances, where a solid foundation can be had, a protection has been made by an eighteen inch pavement on the slope of the bank, which has cost 62 to 75 cents per superficial yard. Where stone has to be transported a distance, this method has been found to be the least expensive. Slope or protection wall has been built on the Ohio canal (Licking valley) at a much less expense than that named above; stone for that purpose being very convenient, and thrown loosely over the bank, forming its own slope. This has been found to be an effectual protection against very strong currents.

The Miami canal, extending from Dayton to this city, is 66 miles in length, with 308 feet of lockage; is under contract (excepting the locks at this place into the river,) to be completed in June next. It is 40 feet in width, with 4 feet depth of water. The locks are, in the chamber, 15 feet by 90. The aqueducts on it are, in part, built with the abutments and piers of stone and trunks of wood. In some instances, large arches are turned, two and three together, and the canal carried over these by an embankment of earth resting on two feet or more of puddle, between bottom of canal and the crown of the arches.

The Ohio canal, commencing at Cleveland, on Lake Erie, and terminating in the Ohio river, at or near the mouth of the Scioto river, will be in length but little different from 310 miles, with 1,185.45 feet lockage. This canal is of the same dimensions as that of the Miami; its locks are also the same, and its aqueducts are constructed upon a similar plan. One hundred and ninety-four miles of this line are now under contract, to be completed by the close of the ensuing season: two hundred and sixty miles of it will be under contract by the close of the season, (from Cleveland to Chillicothe;) and the remain-

der, to the Ohio river, will probably be contracted in the Spring of 1829, to be completed by the end of the year 1830, or the forepart of 1831.

I have prepared the foregoing hasty statement, which, it is believed, adverts to all the inquiries suggested in your communication, in the midst of a pressure of other business. If it will afford you the least aid in the important interest in which you are laboring, I shall be very much gratified.

For any information you may want touching the results of the surveys and estimates made under the authority of this State, in the years 1822, '23, '24, and '25, I refer you to a volume of reports which was, some weeks since, forwarded to Mr. Stanberry, of the House of Representatives.

Yours respectfully,
M. T. WILLIAMS.

The subjoined extracts are from the volume referred to in the preceding letter.

This volume contains the reports of a committee of the Ohio Legislature, of the Ohio Canal Commissioners, and of their Engineers, on the subject of the extensive line of inland navigation, now in progress in that Commonwealth.

These reports furnish much valuable information on the general subject of canal navigation, embracing very clear and detailed views and estimates of the value of this species of navigation, the cost of its construction, and the circumstances which determine its practicability.

On the practicability of constructing a canal.

"No physical obstruction to making a canal, which may not be overcome by the application of sufficient labor, can exist: provided, the requisite quantity of water can be obtained on the highest levels, over which the canal must necessarily pass. But a supply of water on the highest, as well as in the inferior levels, being an indispensable prerequisite to the construction of a canal, it becomes important to determine the quantity of water required to supply a canal on any proposed route, and to ascertain whether that quantity can be procured. To do this satisfactorily, it is necessary to investigate the subject of the expenditure of water in canals, and to test the deductions drawn from theory by practical results, as far as they can be had.

"The amount of water required to supply a given line of canal, depends on a variety of circumstances. The water is exhausted or expended by locks, by leakage, or filtration, by evaporation or absorption. The amount of water expended in passing boats through locks, can be easily estimated. It depends on the capacity of the locks, and the number of boats, which are passed through them.

Thus, a lock of 90 feet in length, of 15 feet in breadth, and of 8 feet lift, requires, to fill it, 10,800 cubic feet of water : or, in passing a boat through it, that quantity of water is expended, or descends from a higher to a lower level, in the canal. A boat, in passing over or through the summit level of a canal, from an inferior level on one side, to an inferior level on the other, requires the expenditure of a lockful, to raise the boat from the lower level into the summit pound, and the like expenditure, to pass the boat, from the summit pound, into a lower level on the other side. Thus, a boat passing the summit, by means of locks of the above dimensions, expends, or draws from the summit pound, 21,600 cubic feet of water. If one hundred boats pass per day, it will require the expenditure of 2,160,000 cubic feet, equal to an average of 1,500 cubic feet per minute. Should the same number pass, in an opposite direction, during the same period, the boats passing alternately, each way, through the same lock, no greater expenditure of water would be required. The lock being filled in raising a boat from a lower level into the summit pound, would be ready to receive the boat prepared to pass down through the same lock, as soon as the ascending boat had left it—and, when the water had been drawn out, to pass the descending boat into the lower level, the lock would be prepared to receive an ascending boat. Thus, one boat ascends and another descends, by filling and emptying the lock but once. But this method of passing boats is not always convenient—as a greater number may be proceeding in one direction than in the other ; and it would be extremely vexatious to compel a boat to wait at a lock, until one should arrive to pass in the opposite direction.

“The dimensions of the locks should be such as to admit boats of the proper size for navigating the canal to advantage. It is a general rule, that the burthen or tonnage of a vessel should bear some proportion to the length of the voyage she is destined to perform, in order to make that voyage profitable. A canal, of the length necessary to pass from the Lake to the Ohio, through the central parts of the State, would require locks of the length and breadth above stated, in order to make its navigation most advantageous to the public. The lift of the locks must, in a great measure, depend on the topographical situation of the country through which the canal line is located. Locks of small lift are more expensive in their construction and the attendance which they require, and occasion greater delay in passing boats than those of greater lift, in proportion to the difference of the levels they overcome. They are, however, less subject to accident, and expend less water. Locks of from eight to ten feet lift are generally believed to combine the most advantages.

“Every canal, which is so located as to be the most convenient channel of commerce, from an extensive region of country, abounding in population and wealth, should be calculated to bear on its bosom as many boats as time will permit to pass through the locks. No delay should be experienced for want of a sufficient supply of water, if it is possible to avoid it. If the supply of water will admit of but half the

business that might otherwise be done, the profits of the canal are but half as great, and the public derives, comparatively, less advantage.

•• Besides, the damage sustained in consequence of unexpected delays in the transportation of property, by individuals who have purchased large quantities for market, is often ruinous to themselves, and distressing to the public. It is important that any channel of commerce, or method of transporting property should be certain, as well as cheap and convenient.

“Two hundred boats may pass through the same lock, in twenty-four hours; and, supposing them to pass in the manner which would require the least expenditure of water, through locks of the dimensions and lift above stated, the quantity requisite to supply the summit pound of a canal with lockage water alone, would be equal to 1,500 cubic feet per minute.

“Different plans have been devised to prevent an expenditure of water, by passing boats from one level to another by means of movable locks and inclined planes. From the examination we have been able to give the subject, they seem to be well calculated to overcome great differences of levels, in contiguous sections of a canal.

“They may, perhaps, be used to advantage in all cases where it is necessary to construct canals in situations where the requisite supply of water to pass boats through locks of the ordinary description, cannot be had.

“The loss of water, from evaporation, cannot be so accurately estimated. It varies in different countries, climates, and seasons, and depends on the exposure to the wind, the temperature of the water, the relative temperature of the incumbent atmosphere, and a variety of other circumstances. It must, however, be observed, that the greatest evaporation usually takes place during Summer and the early parts of Autumn, when the quantity of rain which falls is commonly least, and the streams lowest.

“The loss of water, from evaporation, in the New York canals, though its amount has not been precisely ascertained, is supposed to be much greater than was anticipated before their construction.

“The expenditure of water from leakage, filtration, and absorption, is still more difficult to estimate; so much does it depend on the nature of the earth through which a canal is made, and its manner of construction, that a knowledge of these circumstances is absolutely necessary to form an opinion, with even tolerable accuracy, as to the amount of loss from these means. Some kinds of earth are so loose and porous as to be almost incapable of holding water. This difficulty may, however, be obviated, by puddling or lining with earth of a more impervious quality. Canals, constructed on side-lying ground, and along the face of steep hills, are much more subject to leak than those conducted through level ground, or along the bottom of a valley. Where a canal is made along the face of a hill, the water which enters the lower bank readily passes off to a still lower level, and its place is immediately supplied with water from the canal. This process continually going on, even though the earth is not remarkably porous, exhausts a large quantity of water.

“A line of canal conducted along the bottom of a valley, or on the lowest ground in its vicinity, expends but little water by leakage. The banks, though porous, being once saturated with water, which finds no lower level to which it can escape, permit no water to pass off. The only loss of water, in this case, is from absorption and evaporation. In all cases where the banks of a canal are composed of earth, considerable loss of water must necessarily be sustained, in dry and warm seasons, from absorption.

“The earth which comes in contact with the water will become saturated, and will communicate its moisture to the earth that comes in contact with it; and so on, until the earth, to a considerable distance from the canal, becomes partially, at least, saturated with water. The surface of the earth, which is exposed to the action of the sun and wind, if not abundantly supplied with water, becomes dry and thirsty, and absorbs, with avidity, the moisture from the wet earth, or water, with which it comes in contact. The loss of water, by this process, must necessarily be greater where the water in the canal is raised above a level with the natural surface of the earth in the immediate vicinity; because water more readily descends or passes in a horizontal direction through the earth, than it ascends through the same medium.

“The loss of water from leakage, or filtration through the banks, generally continues to diminish, for some years after the construction of a canal. The banks gradually become more compact and solid; the sediment and small particles of earth are deposited by the water, in the interstices of the larger substances, by which means the whole mass becomes more impervious to water. How long this operation will continue to go on is uncertain, and depends on circumstances; five or six years probably, in ordinary cases, is a sufficient length of time to complete nearly all that may be expected from this process. The loss of water, by leakage, at locks is not very considerable.

“The only satisfactory information relative to the loss of water from evaporation, filtration, and absorption, must be drawn from experience. The deductions from this source of information, which relate to practical operations, can be relied upon with more safety and confidence than those drawn from any other source, and should never be disregarded. Considerable exertions have been made, by the acting Commissioners, to ascertain the quantity of water expended on different sections of the New York canals, which are the great school of the United States, in the science of canalling. The result of those inquiries is given:

“About sixty-one miles of canal line, from Rochester to Seneca river, is supplied with water by a feeder taken from the Genesee river, and two other small feeders between Genesee and Seneca rivers. About six thousand cubic feet of water per minute were required to supply this section of the canal. Five hundred cubic feet of water per minute were probably required, at this time, for passing boats through the locks; which expenditure would admit the passage of fifty boats per day—leaving five thousand five hundred cubic feet

of water per minute to be expended by evaporation, leakage, and absorption ; which would be equal to an average expenditure of ninety feet of water per minute, on each mile of canal. This section of the Erie canal is located on ground favorable to the retention of water, and is considered as a fair specimen of canal line, from which to draw deductions on this subject. Some large embankments occur, but they are so compact and well constructed, as not to occasion the loss of much water. A small proportion of the distance is located on side-lying ground ; but a much greater proportion is constructed on level ground, and through swamps and marshes. The earth is, in most places, well adapted to the retention of water, though, in some places, porous earth is found. Most of this line has been in use nearly two years, and part of it more. Lockage water is only required in one direction, on this section of the canal.

“The Camillus level or summit is about eleven miles in length, and has a lock at each end of twelve feet lift ; it has been filled, and used four years. The ground through which it is located is generally level : no large embankments occur, and the earth is generally well calculated to retain water.

“This level required, last November, an average supply of two thousand cubic feet of water per minute. Supposing the locks at each end of this summit to be filled and emptied forty times in the course of twenty-four hours, which would admit the passage of sixty boats across the summit per day, allowing one boat to pass up and one down, alternately, in half the instances requiring the locks to be filled, which would, perhaps, be a fair estimate, the quantity of water drawn from the summit for lockage, would be nine hundred cubic feet per minute. This estimate would leave eleven hundred cubic feet per minute, to be expended by leakage, evaporation, and absorption, equal to one hundred cubic feet per minute, on each mile. On this summit, there is, in dry seasons, a scarcity of water.

“The Rome summit level is $69\frac{1}{2}$ miles in length, and most of it has been filled with water, and in use five years. The quantity of water expended on this level, in November last, would average about nine thousand cubic feet per minute. Admitting that the same quantity is required for lockage water as on the Camillus summit, though the locks at each end of this level have not so great lift, there would remain eight thousand one hundred cubic feet per minute, to be exhausted by leakage, evaporation, and absorption—equal to an average of one hundred and sixteen feet per minute, for each mile. This line of canal is generally located on level ground, and the earth is mostly of a quality as well calculated to prevent the escape of water, as could be reasonably expected, on any line of the same extent.

“It has been ascertained, that about five thousand cubic feet of water is passed into the canal through the aqueduct at the Little Falls, on the Mohawk river. This water supplies the canal for twelve miles, eastwardly, where an additional feeder from the Mohawk was found necessary. No part of this water is required for lockage, as this section of the canal receives, from the locks above, as much wa-

ter as is required to feed those below. This part of the canal is conducted, for a considerable distance, along the margin of the Mohawk, in artificial walls and embankments, which are very leaky, and is not considered as offering a fair example, from which to judge of the expenditure of water in ordinary cases.

“ From the foregoing it will appear, that the expenditure of water by evaporation, leakage, and absorption, is fourteen thousand seven hundred cubic feet, per minute, on those sections of the Erie canal, from the Genesee river to the Cayuga marshes—the Camillus level and the Rome level making an aggregate length of one hundred forty-one and a half miles : which is equal to an average expenditure, besides lockage water, of something over 100 cubic feet on each mile of canal, per minute.

“ It may, however, fairly be presumed, that the banks, at least on a considerable part of this line, will become considerably more compact, and more impervious to water. If, therefore, we suppose, that, where a canal is constructed on favorable ground, well calculated to prevent the escape of water, after a use of some years, an average of 75 cubic feet per minute, for each mile, will be sufficient to supply the loss occasioned by evaporation, leakage, filtration, and absorption, we shall probably not be far from the truth.”

“ Nearly the same medium quantity of water is supposed to fall on the same area of the earth's surface in different places in the same climate, taking one year with another ; yet the streams which flow in different sections, do not bear an exact proportion to the extent of country which they drain, either in relation to their durability, or the aggregate quantity of water discharged by them in any given period of time. When the soil and the topographical situation of a country are such as not to permit the water to sink into the earth, nor to pass off readily, much of the water which falls, is retained on the surface, until it is exhausted by evaporation, and the streams are neither large nor constant, in proportion to the area of country which they drain. If a district be hilly, and present no obstruction to the escape of the water, and the soil sufficiently impervious to prevent it from entering the earth in large quantities, it passes readily off, in rainy seasons, by the channels of the streams which are swollen to a great extent ; but the water which falls upon the earth, being in this manner soon exhausted, the streams which are large in wet seasons, sink into trifling rivulets, when not supplied by rains. A porous, stony, gravelly, or sandy soil, which drinks, with avidity, all the water that falls upon its surface, and suffers it to pass readily into the earth, where it is neither subject to be exhausted by evaporation, nor to flow rapidly into the channels of streams, is the best calculated to yield a constant and equable supply of water. The earth, in this case, serves as a great reservoir, which equalizes the expenditure of the water that is received into its bosom. In such districts of country, we generally find streams which are neither subject to be swollen into torrents in wet seasons, nor sunk into small rivulets in dry. The country upon the heads of Mad River, Great Miami, and the Tuscarawas, is generally of this character.

“Lakes and ponds, also serve to equalize the expenditure of water. The surface being widely extended, the water rises slowly in proportion to the quantity poured into the reservoir, and declines gradually from the same cause. Accordingly, we find streams issuing from lakes and ponds, generally more constant and less subject to inundations, than those which have not their surfaces thus expanded.

“Streams generally become less in dry, and subject to greater floods in wet seasons, in consequence of clearing and improving the country in which they have their rise, and through which they run. This remark is particularly applicable to such streams as draw their supply from level swampy countries, possessing tenacious and impervious soils. The fallen timber, and other obstructions to the escape of water being removed, and the swamps being drained, the water which was before retained by those natural reservoirs, passes readily off, during rainy seasons, and little is left to supply the streams during those periods when there is no rain. Streams which draw their supply from deep porous soils, are less affected by the clearing of the country. In some instances they may even be improved by this change. In deep gravelly and sandy soils, trees usually strike their roots to a great depth. These roots, especially in warm weather, operate as so many pumps, which intercept part of the water in its passage downward, and carry it into the tops of the trees, where it is expended by a kind of perspiration which takes place from the surface of every leaf. This draft upon the water, which is continued in the soil, being destroyed by removing the timber, more water is suffered to pass into the bowels of the earth, for the supply of springs.

“In these soils, small springs which were subject to fail in dry seasons, before the timber was removed, are afterwards frequently found to yield a constant supply of water, in periods of the greatest drought.

“Reservoirs are often resorted to for the purpose of supplying canals with water, where no streams in their vicinity are sufficiently large and durable to permit a constant draft upon waters requisite to supply the demand. Lakes and ponds may frequently be made valuable reservoirs. The water, in this case, is suffered to accumulate in those seasons which afford a superabundance, and is drawn off for use, whenever it is required. Reservoirs situate near that part of the canal which is to be supplied with water by their means, are the most valuable in proportion to their extent. Thus situated, their waters may be used when necessary, without taking from the reservoir a greater quantity than is needed. But, if situated far distant from the place where the water is required for use, and especially on a higher level, a sufficient quantity must be suffered to pass constantly from the reservoir, to supply the greatest demand; and, when less than usual is required, the surplus must be lost. Reservoirs from which a given quantity of water may be drawn, are more valuable in proportion to their depth; less water is lost by evaporation, both because the water is not so much heated, and because the surface exposed to evaporation is smaller.

“Artificial reservoirs have sometimes been constructed for the pur-

pose of supplying canals, where the requisite quantity could not be obtained from any other source. Deep basins, or ravines, which require a small extent of embankments or walls to confine the water, present the greatest facilities for the construction of artificial reservoirs. Basins have, in some instances, been formed, by excavating the earth, for the purpose of forming reservoirs. The expense of this method of supplying a canal of ordinary dimensions with water, would be enormous, and alone sufficient to prevent its execution, except in cases of absolute necessity, and where the profits of the work would warrant encountering the expense. Reservoirs may also be formed by raising embankments or walls, on all or some of the sides of a level tract of ground, having some stream in its vicinity, susceptible of being turned into the enclosure. A work of this kind must be attended with great expense, subject to many accidents from the breaking, or undermining of the banks, and would probably endanger the health of the country in its vicinity, unless made very deep."

"The Committee to whom was referred so much of the Governor's message as relates to Canals, beg leave to report:

"That the superior importance of improving the means of intercourse between different parts of a country, being a well established principle in political economy, it will not be necessary to adduce to the House the evidences of its illustration, which are afforded in the examples of the most illustrious countries of the old world, and in parts of our own; neither have they occasion, in the performance of their present duty, to urge, with the intelligent members of this body, the peculiar applicability of this doctrine to an agricultural State, so remote from the sea as our own. It is a well established fact, that man has not yet devised a mode of conveyance so safe, easy, and cheap, as canal navigation; and although the advantage of easy and expeditious transportation, is not so likely to be perceived when prices are high and trade most profitable, yet the truth is familiar to every person of observation, that the enormous expense of land carriage has frequently consumed nearly, and sometimes quite, the whole price of provisions, at the place of embarkation, for a distant market. This is essentially the case in relation to all commodities of a cheap and bulky nature, most of which will not bear a land transportation many miles, and, consequently, are rendered of no value to the farmer, and are suffered to waste on his hands. The merchant who engages in the exportation of the country, finding it a losing commerce, abandons it, or is ruined; and crops in the finest and most productive parts of the State, are left to waste on the fields that produced them, 'or be distilled, to poison and brutalize society.'

"The profits of agriculture, and the reward of labor, failing, industry must languish, and the train of evils must succeed, always consequent on such a state of things."

"It [the proposed canal of Ohio] would operate as another artery in the body politic, not merely beneficial to its neighborhood, but diffusing

wealth, activity, and vigor, to the whole ; and it will be allowed us to predict, that, if it were once completed, the inhabitants of Ohio would witness its annihilation with as much regret, as that of the noble river, or the beautiful lake, whose waters wash so large a portion of our borders. So long as the produce of our farms shall constitute our staple articles of trade, the market of New York, from its capital, tonnage, commercial situation, and climate, will continue preferable to that of New Orleans ; and with the aid of the artificial navigation in question, the valley of the Ohio, from Pittsburgh to the Falls, can realize a sale of its exports much sooner, and the transportation will cost much less, and be attended with less risk, than if a market were sought through the Mississippi. All parts of the Western country have felt, and still feel, the destructive effects of that climate on our provisions ; the experience and observation of all who have been in that trade, can testify to the deleterious influence of the climate on our boatmen and traders, and the sacrifice of life and health at which that commerce is prosecuted.

“An adventurer arriving at New Orleans, in the Spring, with a cargo of flour, &c. most frequently finds the market overstocked, especially at that season of the year which admits him to descend from the country above the Falls. To leave his property, is to abandon it to destruction ; to wait for a higher price, is to incur the dangers of an unwholesome climate. He must ship his flour, or sell at a sacrifice—oftentimes at a price that will not pay freight and charges. It is *fair*, therefore, to compare the delay, cost, and risk, of sending the cargo from the Ohio, to some port beyond the Gulf of Mexico, with the time, charges, and risk, that will be incurred in transporting it to New York by the projected canal ; and to compare a voyage to New Orleans, by a circuitous and dangerous navigation—through more than ten degrees of latitude—approaching the torrid zone—exposed to all the deleterious effects of the climate, on the constitutions of persons from a northern latitude—with a safe and expeditious voyage through the heart of our State, and that of our sister State, in a healthful climate, and supplied with all the necessities and comforts which a thickly settled and highly improved country will afford. In the first case, the difference in time will be several weeks, and in cost, at least equal to the charges of shipping the cargo from New Orleans to some Atlantic port ; and, in the second case, equal to the difference between an unhealthful climate, dangerous navigation, and a tedious voyage, in returning, of sixteen hundred miles against the current of the Mississippi and Ohio, and a healthful climate, safe, expeditious, and easy voyage, both going and returning.

“The views of your committee may be further illustrated by the following exposition, which will apply to all the commerce that would pass the falls of the Ohio for New Orleans, if no other channel for exportation should be opened. At the time of the late rise in the price of flour, it was worth, at Cincinnati, \$3 50 per bbl., and, at the same time, was worth \$8 in New York ; and was purchased at each of these markets, for the then expected demand in England. The cost

of transporting a barrel of flour, from the former to the latter market, through the contemplated canal, is estimated at \$ 1 70, which, added to \$ 3 50, the cost at Cincinnati, would make \$ 5 20, the cost at New York—deduct this sum from \$ 8, the value at the latter market, and there is left \$ 2 80, the increase in value of a barrel of flour at Cincinnati, produced by the facility of transportation afforded by the proposed canal. The committee find there was inspected, at Cincinnati, for exportation, in the season of 1818-19, as appears by the return of the Inspector of Hamilton county, 130 000 barrels of flour, which, at the enhanced value of \$ 2 80 per barrel, as above shewn, would make \$ 364,000, the increase in the value of that quantity of flour, which would be fairly attributable to the increased facility of transportation to that market. Thus,

Transportation of bbl. flour through the <i>Ohio</i> canal,			
at \$ 2 per ton,	-	-	- 20 cents
Toll through do. at \$ 3 00 per ton	-	-	- 30
Transportation across the lake	-	-	- 20
do. and tolls New York canal	-	-	- 80
do. from Albany to New York	-	-	- 20

\$1 70

Cost at Cincinnati, 3 50—\$5 20

which deduct from \$8 00 the price at New York, will leave \$2 80; which, on 130,000 barrels, would give \$364,000 profit to the farmers of the Miami country on one year's crop of wheat. It may be supposed by some, that this calculation is extravagant and visionary, which, however, if investigated, it is believed will not appear entirely so. But to remove such impressions, should any exist, deduct the 64,000 dollars to cover any error that may exist in the principle assumed; or, if it be thought necessary, deduct 164,000 dollars from the result, and there will still remain 200,000 dollars profit, or increase of value on one year's crop of wheat in that small section of our State. If this estimate of the increased value of the agricultural products of this section of our State, have any foundation, and your committee believe it has, the principle assumed will apply equally, if not more forcibly to other parts of the State. The committee assumed this point from which to make an estimate, because it was the only point at which they could obtain any thing like certain data from which to reason—knowing that the principle here assumed would apply equally to other parts of the State.

“By way of further illustration, it has been estimated by the committee, that the county of Pickaway grows 400,000 bushels of wheat annually; this would make 80,000 barrels of flour, which, estimating ten barrels to the ton, would make 8,000 tons for transportation. Suppose the canal to pass through this county—at three dollars per ton freight and tolls, the transportation of 8,000 tons would amount to 24,000 dollars; the same transported to the Lake by land, would cost at least 25 dollars per ton, and would amount to \$200,000; shewing a difference between the two modes of transportation, in

favor of the former, of 176,000 dollars, to one county through which the canal passed, in the single article of flour. Suppose ten counties on the line of the canal, each producing an equal quantity of flour, and there are that number from the mouth of the Scioto to Sandusky bay, which will produce an equal amount, so soon as access can be had to a steady market, and the result will be upwards of a million and a half of dollars increase in the value of the flour which these ten counties would annually produce, if there were a sufficient incentive to the industry of the farmer. If this be correct as to flour, it is equally so as to every other article which these counties would produce for exportation. And, from what has been shewn relative to the risk and uncertainty of the New Orleans trade, which will apply with increased force to the country in the interior of our State, it is very evident that the exports from this section of country will not seek a Southern market while they can find their way, at less cost and risk, direct to an Atlantic market, at all times a safer one."

"Your committee have not exhausted this interesting subject; they have omitted numerous important particulars, tending to strengthen the position they have taken, and to shew the advantages that would result to the State of Ohio and to the Union, from the contemplated improvement. Their calculations are adapted to a state of profound peace with the rest of the world, and they hope that state may be long preserved; but, should the injustice and aggression of other nations produce a maritime war, obstructing our commerce through the Gulf of Mexico, and with the Atlantic ports, the freights that would be borne on the bosom of our canal would exceed any calculation that can be made, and would increase the revenues in the same proportion; or, should our country again be scourged with a war with Great Britain, the facilities a canal would afford to the operations of war, by its expeditions and cheap transportation of military stores and munitions to the frontier posts, would save to the nation, in money, more than its whole cost, and, in the lives of her citizens, immense worth and blood. The committee leave to the imagination of the members of this House to picture the political importance the State would derive from such an enterprise and its consequences. They are convinced that, if the scheme of uniting Lake Erie and the Ohio, by a navigable communication, shall be found practicable, it cannot be too soon commenced. They are unable to perceive the probability that the State will be better prepared, in the course of fifty years, than within the next five, to accomplish the project. Perhaps a century may not witness a similar stagnation of commerce in all parts of the world, and so much capital, in consequence, disengaged from that employment. The present cheapness of labor and subsistence, mark this as the auspicious period for the undertaking; the consumption by the workmen will furnish a considerable market for provisions; and we may add, a consideration of some importance in the actual state of the country, that the expenditure on this great object of lasting utility will more effectually relieve the citizens of Ohio from pecuniary distress, than all the schemes of paper credit that our sister States

have adopted. The year 1823 will witness the completion of the New York canal, when the experience of their engineers and their contractors ; their improvements in labor saving machinery, and implements for the execution of the work, with the laborers now employed in that undertaking, may be brought in aid of ours, should the State think proper to embark in the enterprise. [Date of Report, 1822.]

“ In relation to the general policy of constructing canals, wherever the features of a country will permit, and commercial intercourse may demand, no change of sentiment has taken place, except a more thorough conviction of their utility and profit, which has been the result of further investigation, and of information derived from experience. The decided preference which canals possess over every method hitherto devised for the improvement of inland communication, is becoming every day more apparent. The construction of the Grand Canal in New York, has thrown additional light on the science of canalling, and more strongly illustrated its benefits, than any other work of the kind ever performed.

“ Difficulties have there been encountered and overcome, of which no adequate idea can be formed, without an actual inspection of the work ; and in comparison with which, the most serious obstructions presented to the construction of a canal across this State, dwindled into comparative insignificance.” [Report of 1824.]

Extract from Governor Morrow's message, of 1824.

“ The contemplated canals from the Ohio river to Lake Erie, and from the Ohio to the Chesapeake for opening new avenues to commerce at markets in a favorable climate, are projects of improvement which promise advantages almost incalculable to the Western country.”

Cost of the Ohio Canal—Extract from Commissioners' report of 1824.

“ We are apt to consider works, with which we are unacquainted, as fraught with difficulty in their construction, and of doubtful utility, when completed. Thus we view the making of a turnpike road of the most perfect kind, as a measure within the reach of a small company ; for they are common in some parts of our country ; whilst a canal of the same extent is thought to require an exertion which none but a powerful nation, or an absolute monarch, is capable of making ; for canalling is a science to which, until lately, we were strangers, and, even now, a knowledge of it is but partially diffused. Yet experience has shewn that a canal, on favorable ground, can be constructed nearly as cheap as a turnpike road properly formed of stone ; that the canal is most easily kept in repair, and that the facilities which it affords for the transportation of property, are ten times as great.

“ Many people seem to think that every dollar expended in public improvements, is so much loss to society ; that it is annihilated ;

gone out of existence, never more to return. Such opinions are founded in error. Even public works, which are erected for mere show and ostentation, which afford no profit, and are of no practical benefit when completed, do not necessarily diminish the wealth of the community by whom they are constructed; if to effect these objects, the rich are taxed, money is drawn from the secret recesses in which it has long lain useless; the labor of those, who would otherwise have remained idle, is put in requisition, and by this labor alone the work is erected; the money still remains in the country, but has only changed hands, generally for the better. If then a work, useless in itself, does not necessarily detract from the wealth of the community, one of great public utility can hardly fail to add to that wealth. It is believed by many men of extensive knowledge and enlarged political views, in New York, that the construction of their great canals, would be beneficial to that State, even admitting those works to be abandoned the moment they are completed. Such has been the general spring given to industry; such the amount of labor put in requisition, which would not otherwise have been called forth; such the benefit arising from the distribution of money in the best possible manner; that the inhabitants are now better able to pay the interest on all the moneys borrowed for that work, than they would otherwise have been to pay their ordinary tax without it. But, fortunately, this is not required of them. They now reap the benefits of that magnificent undertaking, without even feeling that they are taxed to pay the interest of the moneys expended in its construction."

Extracts from the Commissioners' report of December, 1824.

"The work has now progressed so far, that its fair value is well ascertained. Work of almost every description, required in the construction of a canal, has been performed, and some of the jobs, taken at the lowest rates, have been completed. Most of the contracts have been taken at prices, which, with judicious management, will yield a handsome profit to the contractors: some of the sections have, however, been taken at prices which will require strict economy, and good management, to nett even a small profit."

"It is still believed, that the estimates submitted to the last General Assembly, in relation to the revenue which will be derived from the canals, in the different stages of their progress, and on their final completion, will be fully realized. The immense and rapidly increasing amount of the surplus productions of the State, which will seek a market through the canals when completed—the direction which is now given to such of those productions as will bear transportation to the navigable waters which form our northern and southern boundaries, fully justify this belief. The examples afforded us in the productiveness of the Grand Canal of New York, now happily completed, gives us strong assurances that our own, when finished, will be profitable to the State, as well as beneficial to its growing population.

"The Board do not anticipate, that the same amount of transporta-

tion will be done on the Ohio Canal, immediately after its completion, that is now done on the Erie Canal of New York; nor will this be necessary in order to derive from tolls the same per centum on its cost. The expense of constructing the Ohio Canal will not be, on an average of its whole length, more than half as much per mile, as that of the Erie Canal of New York. This difference arises chiefly from the great difficulties which were encountered on some parts of that canal, and from which ours is happily exempt. We have no mountain ridges of solid rock to cut through, nor precipitous ledges, like those of the Mohawk, to encounter. The abundance of materials which are, almost every where, found in the vicinity of our line, and the wonderful ease with which they are procured and fitted for use, also contribute greatly to this difference in cost. Such are these facilities, that forty locks, now under contract, on the Ohio Canal, almost all of them to experienced and able contractors, who are at this moment prosecuting their jobs with the greatest energy, are taken at an average price of a fraction less than \$ 517,12½ per foot lift; whilst those on the New York Canal are estimated to have cost, on an average, nearly double that price.

“Our canals pass through countries at least as fertile, and capable of yielding as great a quantity of productions, for market, as those of New York; and, although our situation is more distant from the place of market, the same necessity exists of reaching that market with all such articles as will bear transportation. It is true, the Erie Canal terminates in tide water, and leads to the city of New York; ours, also, is directed towards the same point. That canal connects the Ocean with the great Lakes; ours will connect the same great Lakes with the extensive navigable waters of the Ohio and Mississippi, and, through them, with the Gulf of Mexico and the West Indies. The New York Canal connects distant countries, situated nearly in the same latitudes, and yielding the same productions; the Ohio Canal will connect distant countries, lying in different latitudes, each abounding in productions not common to the other, making an interchange through this channel mutually beneficial to both.”

From a report of Nathan S. Roberts, Esq. May 25, 1825.

“An Abstract shewing the amount of each item of expense to be incurred in constructing the Ohio Canal, from Coshocton to Lake Erie, by each of the proposed routes.

BY THE FIRST ROUTE—TUSCARAWAS AND CUYAHOGA.

First Section, from Coshocton to Portage Summit, 94m. 13ch. 55lks.

Grubbing and clearing,

preparatory	3,643,	at 7 50,	27,322 50,	
On barrows	- 3,044,	at 5 00,	15,220 00,	
				\$42,542 50
Excavation	- 2,460,517	cubic yards	-	277,297 39
Embankment	- 895,776	do.	-	147,446 70

Protecting walls at wash-			
bank, &c.	28,050 20 cubic yards	-	\$ 28,050 20
Culverts, in number	25, from 4 to 20 feet chord,		9,420 41
Lockage, 205 feet	205 feet lift, 37,601 perches,		131,746 39
Aqueducts, in number	2	-	24,931 09
Dams and feeders	-	-	2,421 00
Road bridges	18	-	2,180 00
			<hr/>
			\$666,035 68
			<hr/>

Distance 94 miles, 13 chains, 55 links; the average cost per mile is \$7,072 69 cents.

Second Section, from Portage Summit to the Lake at Cleveland.

Grubbing and clearing,			
preparatory	2,005 chains, at \$7 50,		17,123 25
Excavation	1,087,162 yards, at various	-	125,839 86
Embankment	274,648 do. at do	-	44,235 06
Protecting walls to			
wash-banks	12,522 do. at \$1 60	-	12,522 09
Culverts, in number	12, from 4 to 10 feet chord		4,309 13
Lockage, 394 feet	70,716.57 perches, at \$3 50		247,661 96
Aqueduct	1, at Peninsula	-	2,706 00
Dams and feeders	-	-	700 00
Road bridges, in number	11, and changing road	-	1,410 00
Towpath down Cuyahoga	-	-	4,690 00
Harbor at mouth of Cuyahoga	-	-	5,000 00
			<hr/>
Total	-	-	\$466,197 26
			<hr/>

Distance 38 miles, 8 chains, \$12,236 14 average per mile.

Total distance from Coshocton to the Lake, by this route, is 132 miles, 21 chains, 55 links; total amount of lockage is 599 feet; and the total amount of expense is estimated at \$1,132,232 94; the average cost per mile is \$8,560 00.

SECOND ROUTE—KILBUCK AND BLACK RIVER ROUTE.

First Section, from Coshocton to Kilbuck Summit, 63m. 11ch. 50 links.

Grubbing and clearing,			
preparatory	4,037.50 chains, at \$7 50		\$30,281 25
Excavation	1,950.256 cubic yards, various		205,250 96
Embankment	765,146 do	-	144,479 93
Protecting walls for			
wash-banks	7,280 do. at \$1 00	-	7,280 00
Culverts, in number	17	-	4,177 54
Lockage, 144 feet	26,258.92 perches, at \$3 50	-	91,906 22
Aqueducts, none.			

Dams and feeders, and towpath bridges	-	-	8,561 00
Road bridges, in number 11	-	-	1,210 00
Guard locks - 3	-	-	3,000 00
Total	-	-	<u>\$496,146 90</u>

Distance 63m. 11ch. 50 links ; average cost per mile, \$7,857 87½.

Second Section. from Kilbuck Summit to the mouth of Black river.

Grubbing and clearing preparatory	2,593 25 chains, at \$7 50	\$19,447 88
Excavation -	1,199,012 cubic yards, various	130,418 86
Embankment -	554,718 do. do	76,778 84
Protection wall on wash-banks, none		
Culverts, in number 31	- -	17,368 86
Lockage, 333.7 feet, 60,389.91 perches, at \$3 50	-	211,364 38
Aqueducts, none		
Dams and feeders, none		
Road bridges - 10	- -	1,100 00
Towpath to the mouth of Black river	- -	4,000 00
Harbor at the mouth of Black river	- -	5,000 00
Amount	- -	<u>\$465,478 82</u>

Distance 35 miles, 2 chains, 69 links ; average cost per mile, \$13,286 85.

To this add Cuyahoga feeder, 49 miles, 40 chains, cost 378,618 84

Total distance, Canal,	98m. 14 ch. 19 links.	
Canal and feeder	147 54 19	
Average cost \$9,075 51	Amount - -	<u>\$1,340,244 56</u>

The total amount of lockage on this route is 447 $\frac{1}{10}$ feet, total expense as above.

THIRD ROUTE—BY KILBUCK, CHIPPEWAY, AND CUYAHOGA.

From Coshocton to Kilbuck Summit, as above stated,	\$ 496,146 90
From Kilbuck Summit, through Chippeway Swamp, to Portage, the distance is stated at 33 m. 27 ch. ; the average expense, per mile. is \$ 9,900 18	- 377,196 99
From Portage Summit to Cleveland, as above	- 466,197 26
	<u>\$ 1,339,541 15</u>
Whole distance, 134 m. 46 ch. 50 lin. ; aver. 9,953 49	
To this amount add expense of Cuyahoga feeder	- 127,531 12
Amount	<u>\$1,467,072 27</u>

Total average cost per mile, \$10,901 11.—Total amount of lockage is 599 feet.

General Abstract from the preceding.

FIRST ROUTE.	SECOND ROUTE.	THIRD ROUTE.
Cuyahoga and Tuscarawas.	Kilbuck and Black River.	Kilbuck and Cuyahoga, by Chippeway and Portage.
Lockage - - 599 feet.	- - 477.7 feet.	- - 599 feet.
m. ch. lin.	m. ch. lin.	m. ch. lin.
Length of Canal 132 21 55	- - 98 14 19	- 134 46 50
	Feeder, 49 40 00	- 11 40 00
	<hr/> 147 54 19	
Cost, per mile, \$ 8,560 00	- - \$ 9,075 51	- \$ 10,901 11
Total expense \$ 1,132,232 94	- \$ 1,340,244 56	\$ 1,467,072 27

To the above estimates should be added ten per cent. for contingencies and superintendence. By examining the book of estimates, it has been ascertained that several omissions had happened in carrying out, &c. Some addition to the estimated price of the protecting walls has been made. It is believed the above statements contain a fair and correct valuation of the several items of expense, (with the additions abovementioned) and of the distance and amount of lockage, on each of the proposed canal routes."

RECAPITULATION, shewing the aggregate amount of work, of the various kinds, under contract, north of Portage Summit, the average price, and total amount in money.

DESCRIPTION OF WORK CONTRACTED.	AMOUNT OF EACH KIND OF WORK.	AVERAGE PRICE OF THE VARIOUS KINDS OF WORK.	Total amount of each item in money.
Grubbing and clearing	2,695 chains, 80 links, 33 miles, 55 8-10 chains	\$6 65½ per chain, \$552 13 6-10 per mile	\$17,931 89
Earth excavation	855,189 cubic yards	8 57-100 per cubic yard	73,318 87
Rock excavation	12,500 "	24 88-100 "	3,110 80
Embankment	345,166 "	11½ "	40,615 45
Lockpit excavation, earth	59,976 "	16 64-100 "	9,982 69
Do do rock	3,489 "	70 9-10 "	2,473 75
Locks	67,014 perches, 373 feet lift	2 87 8-10 pr'p'ch, 517 12 35-100 pr ft lift	192,888 10
Aqueducts, mason work, abutments, and piers	3,531 perches	1 87 8-10 per perch	6,632 00
wood trunks of do	Length 296 feet	4 66 9-10 per foot	1,382 00
foundations of square timber			
Culverts, mason work	3,014 perches	1 96 42-100 -	210 00
square timber in foundations	10,460 feet	02 63-100 per foot when laid	5,920 12
Protection moles of crib	94,863 feet	03 82-100 "	275 20
work	43,854 feet	01 78-100 "	3,626 07
Filling cribs with stone and gravel	16,681 cubic yards	16 2-10 per cubic yard	770 02
Protection walls of stone	3,510 perches	28 8-100 per perch	2,701 39
Piles for protection of banks	1,325 piles	35 85-100 per mile when driven	985 90
Piles in lockpits	1,050 piles	81 "	475 00
Dam and waste weir			850 00
Miscellaneous items, not included under the above heads		aggregate amount	259 00
			2,540 42
Total			366,939 67
To the above should be added the expense of building fifteen road bridges over the canal, not yet contracted, and not included in the above abstract, at an average cost of \$ 180 00, including embankment for abutments			2,700 00
			369,639 67
			Dls.

RECAPITULATION, shewing the aggregate amount of each of the various kinds of work performed on 33 miles 55.80 chains of canal line, under contract, north of Portage Summit, previous to November 20, 1825.

Kinds of work performed.		Amount done.	
Grubbing and clearing	- - -	1,797 ⁸⁰ / ₁₀₀ chains	22 miles, 37 ⁸⁰ / ₁₀₀ chains
Earth excavation, in canal	- - -	136,313 cubic yards	
Ditto in lock-pits	- - -	28,140 ditto	
Total amount of earth excavation	- - -	-	164,453 cubic yards
Rock excavation, in canal	- - -	70 cubic yards	
Ditto in lock-pits	- - -	640 ditto	
Total amount of rock excavation	- - -	-	710 ditto
Total amount of excavation	- - -	-	165,163 yards
Embankment	- - -	44,760 cubic yards	
Ditto stone and gravel in crib work	- - -	893	
Total amount of embankment	- - -	-	45,153 yards
Locks commenced, three, stone work laid in ditto	- - -	1,744 perches	
Foundation of locks laid, three : walls not commenced	- - -		
Face stone for locks, cut and delivered	- - -	17,102 feet	
Ditto cut, and not delivered	- - -	1,334 do.	
Total amount cut, and not laid	- - -	-	18,436 feet

Ditto quarried and delivered, not cut	-	-	-	5,149 feet	-
Ditto, ditto, not delivered, not cut	-	-	-	22,678 feet	-
Total amount quarried and not cut	-	-	-	<u>27,818 feet</u>	-
Total amount of face stone quarried, not laid	-	-	-	<u>46,254</u>	-
Stone for backing lock walls and for aqueducts, delivered	-	-	-	4,140 perches	-
Ditto, quarried and not delivered	-	-	-	2,235 ditto	-
Total amount of ditto, quarried and not laid	-	-	-	<u>6,375 perches</u>	-
Timber procured and laid into cribs	-	-	-	5,540 feet	-
Ditto, hewed for cribs and culverts	-	-	-	22,900	-
Ditto, ditto, for lock foundations	-	-	-	37,400 feet	-
Total amount of timber not laid	-	-	-	<u>60,300 feet</u>	-
Total amount of timber prepared	-	-	-	<u>65,840 feet</u>	-
Piles for lock foundations, delivered	-	-	-	600	-
Castings for locks, delivered	-	-	-	5 tons and 750 pounds	-
Clearing for basins	-	-	-	28 acres.	-

RECAPITULATION, showing the several kinds of work under contract on the Licking Summit; amount of each kind; and the average contracted.

Licking Summit, 10 miles, 36 chains—Reservoir bank, 2 miles, 23 chains.—Total under contract, 12 miles, 59 chains.

THE KINDS OF WORK.	AMOUNT OF EACH.	AVERAGE PRICE AS CON- TRACTED.	TOTAL.
Grubbing and clearing	Canal line, 10 miles, 36 chains, Reservoir bank, 2 miles, 23 chains Extra grubbing for the reservoir and other banks	\$ 6 59 per chain 6,718 58	
Excavation -	280,508 cubic yards	- 995 00	7,713 58
Embankment -	408,957 do	at an average of 8½ cts, nearly do 11 cts. 1 mill	24,096 28
Culverts, seven in number	1,687 perches of stone work	will cost, say \$3 per perch	45,632 28
Aqueducts, one, S. fork Licking	771 do	do 3 2,313 00 }	5,061 00
	100 feet of wooden trunk	per foot run 6 600 00 }	2,913 00
Total canal line and reservoir			\$85,416 14
To this amount may be added the cost of three road bridges not under contract, estimated at \$180 each, including embankments			540 00
			<u>\$85,956 14</u>

Average cost per mile, including the extra cost of one and a half miles of the reservoir bank, which is connected with the canal - - - - - \$ 6,320 nearly.

The above line, including the reservoir, was estimated in the last report of the Board to the Legislature at		\$ 93,356 25
To which add ten per cent. to cover contingencies, as stated in said report,		9,335 62
Total of former estimate		<hr/> 102,691 87
From which deduct the amount of the above abstract, at contract price		- 85,956 14
Leaving a balance in favor of the contract prices of		<hr/> \$ 16,735 73

Since the reservoir embankment has been placed under contract, it has been deemed advisable to place a wall of timber in the centre of the bank, to guard against the operations of the muskrats and crawfish.—This is an additional item of cost, which was not included in the original estimate, and is not included in the above statement, because its amount is not known. It is to be paid for at the appraisal of the principal Engineer.

The price of the culverts and aqueduct is not fixed in the contracts. They are to be paid for at the estimate of the principal Engineer. At the time of the sales, it could not be determined where the stone could be obtained. It is believed, they can be built at the price stated, which is fifty per cent. above the estimate.

RECAPITULATION, shewing the several kinds of work under contract on the Miami Canal, from Middletown to Cincinnati, (42 miles); amount of each kind; and the average price as contracted.

THE KINDS OF WORK.	AMOUNT OF EACH KIND.	AVERAGE PRICE AS CONTRACTED.	TOTAL.
Grubbing and clearing -	3,360.87 chains, 42 miles	\$4,08½ pr. chain, or about \$327 pr. m.	\$ 13,735 38
Excavation -	1,519,133 cubic yards	Average cost per yard 7 17 cents	118,959 32
Embankment -	688.628 "	" 10 04	69,159 50
Culverts, 26. -	8,083 perches	" perch 2 07	16,731 42
" Pits, foundations, &c. estimated to cost -	-	-	10,272 00
Locks, 12, (100 feet lockage,) -	18,910 perches of masonry	" per perch 4 00	72,640 00
Excavation of lock-pits -	17,350 cubic yards	" yard 14 38	2,495 00
Aqueducts -	9,882 perches of masonry	" perch 1 88½	18,559 00
" Wooden trunks -	478 feet	" foot run 703 04	3,361 50
" Excavation of pits and foundations, estimated to cost -	-	-	4,000 00
Waste wiers -	-	-	1,430 00
Road bridges, wood work -	22 -	104 00 each	2,295 00
" Embankment -	" -	nearly 68 00 "	497 80
Wall of timber in the river -	1,200 feet	67 pr. ft.	804 00
Pavement, or protection wall -	4,300 yards	36 pr. yd	1,554 00
Miscellaneous items, such as stone walls, changing the channel of creeks, land drains, &c. -	-	-	1,810 22
Mucking the whole length of the forty-two miles, 246,000 cubic yards, at eight cents, -	-	-	19,680 00
Total cost,	-	-	\$ 558,984 14

Average cost per mile of forty-two miles, including twelve locks	-	-	\$8,547 24
The locks in the above abstract are placed at \$4 00 per perch. They were mostly contracted for to be built of timber, but have since been changed, and are to be built of stone, so far as it can be obtained at reasonable expense.	-	-	
The line from the Ohio river to the Miami, near Middletown, on the low level, was estimated in the last report to cost	-	-	\$381,140 00
To which add the difference in cost of the high level, as estimated	-	-	45,000 00
			<hr/>
Ten per cent. to cover contingencies, as stated in the report	-	-	426,140 00
			42,614 00
			<hr/>
Total cost, as estimated	-	-	468,754 00
Amount of contracts as above shewn	-	-	
Estimated amount of line, not under contract, to the Ohio	-	-	358,984 14
Ten per cent. to cover contingencies on the above item	-	-	75,926 00
			<hr/>
			442,502 14
			<hr/>
Balance in favor of contracts	-	-	\$26,251 86
			<hr/>

It will be recollected, when examining this comparative statement, that on the locks in this line there is no saving from the estimates, owing to the scarcity of stone; and that the first ten miles of the canal, below the feeder from the Miami, is constructing with an increased depth of one foot, and increased width of three and a half feet, and the next fifteen miles with an increased depth of six inches, and in width of one foot nine inches.

The estimates of last year were made for a canal of the usual dimensions.

The State of Ohio raised the sums required for her canals by loans ; preparatory to which, a correspondence took place between the Canal Commissioners of Ohio, and certain gentlemen in New York, of which the following extracts are made :

Letter from William Bayard, Esq. dated November 15th, 1823.

“As to the financial resources requisite for the union of the lakes and the Ohio river, I cannot cherish any well-grounded apprehensions. I am informed that the State of Ohio has great resources, an extensive and fertile territory, and has now a population exceeding seven hundred thousand souls—intelligent, enterprising, and industrious people, who, in twenty years, will more than double their present number. Your pursuits being, to a very great extent, agricultural, are, therefore, safe, and exempt from great hazards and losses ; the habits, too, of the People of Ohio are moral, and the patriotism of your State unsullied ; under these circumstances, the question arises—Should the State of Ohio come forward and pledge her faith and her resources, could she raise money in the market, on a long credit, to commence and carry on her great and splendid work of internal improvement ? I think she can. With the prompt payment of the interest on the debt to be contracted, payable quarterly, as is adopted by the State of New York, which no doubt the State of Ohio is competent to, there can, I think, scarcely be a doubt but that the requisite funds can be obtained for this object, and, even if not in the United States, in Europe, where the excess of capital is so great. With the great security the State of Ohio could give for payment of principal as well as interest, I am really inclined to believe that the foreign capitalists, would, with avidity, adventure in a loan of this nature, in preference to many of the foreign loans opened in Europe. Presuming, beside the responsibility of the State, the canal would, also, or its revenue, be appropriated, in part, to the payment of the interest, I cannot, as I before remarked, cherish any well-grounded scruples as to the ability of Ohio to contract sufficient loans for the accomplishment of her contemplated canal, should the State offer to mortgage it for thirty or more years, even to individuals forming a company ; this, however, is merely my opinion. I know that, in London, New Orleans Corporation Stock has been sold at a premium : but upon what basis it is secured I know not. Certainly it cannot be more firm than the State of Ohio can offer—and I think, abroad, her stocks would command public confidence, as well as throughout the Union. We have, for our foreign friends, invested largely in our State Canal Stock, to which a preference has been given from the long period it has to run ; and which has the entire confidence of foreigners.”

Letter from John T. Champlin, Esq. November 17th, 1823.

“In giving my opinion on this subject, I must be permitted to premise, that the opinion I give is founded on the belief that there will not be any considerable change in our money market, from the pre-

sent state of it. Supposing this to be the fact, I have no hesitation in saying that there will be no difficulty in obtaining these loans, as they may be required for the object; provided satisfactory laws are passed and arrangements made to pay the interest in this city, as well as the principal. This is indispensable : for, although large capitalists take, in the first instance, such loans by contract, yet they afterwards are divided and subdivided into small sums, the interest of which the holders depend on for their support ; the aggregate amount held in this way, in all public stocks, is almost incredible. For this reason I would by all means recommend the interest to be payable quarterly, as the public stocks of the United States and those of this State are. The contractors of stocks, look to the London market, also, for sales to great extent, oftentimes. Indeed, of late, the stocks in this country are a pendulum to regulate foreign bills of exchange, and are negotiated as a substitute to the latter ; and, therefore, it is all-important that the interest should be paid here, and that quarterly ; which will put them more on a par with the stocks of this State. Any deviation will tend to injure the credit of them more than any benefit that can possibly result from any other plan."

"The contemplated object is, indeed, one of great national importance, and to this State and city particularly, and I most ardently pray it may be undertaken. If your State is free from debt, as I understand it is, there certainly ought not to be any hesitation whatever on the subject. The obtaining the loans *only* depend on your laws that may be enacted to provide for the interest, not for *money taken out of the State, but for capital brought into it*. The effect, in our own State, of *capital taken out of the city*, (or from England, or wherever the stock is held,) has been of incalculable advantage, so much so, that it is not thought extravagant to say, that, if our canal had cost double what it has done, it would be *more than double* the advantages of it. If this be so, how much more advantageous is it for your State to bring the whole of this capital into it *from other States or places* ?"

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TABLE showing the prices of various kinds of work performed in the construction of the different sections of the Delaware and Hudson Canal.

[illegible]

NEW YORK, November 5, 1823.

Brevet Maj. Gen. ALEX. MACOMB,

Colonel commanding U. S. Engineers.

SIR: The Board of Engineers, being directed, by orders of the 15th of August, to visit the proposed canal through the mining districts of New Jersey; to confer with the Commissioners of the State on the subject; and to report to the Engineer Department the result of their labors—having complied with the first parts of their instructions, have now the honor to present the following report:

Of all the means which human ingenuity has devised for facilitating communications between different parts of a country, canals occupy, at the present day, the highest rank; and, when well planned and judiciously located, they not only become sources of individual wealth, but they diffuse prosperity over extensive regions, and result in economy and advancement of the nation at large. In Europe, for some time, opinion was in favor of canals of large dimensions, and, in these, magnificence was often as much regarded as utility; now-a-days, however, experience and more precise calculation have taught that it is necessary to reject every useless expense, and that the cost of construction and repairs must have a certain ratio to the revenue: being, in this respect, like all commercial speculations. When viewed, however, with reference to general rather than individual advantage, the condition that the income must bear a certain proportion to the principal invested, cannot be considered as absolute: for the revenue from a canal may be much less than that on ordinary investments, and yet the benefits amount to much more as regards national economy and advantage. On this hypothesis, the deficit of revenue is amply compensated, as regards the nation, by the greater facility and speed of transportation; thereby making the articles conveyed less costly, the circulation of capital more rapid, and a larger proportion of the labor of men and animals disposable for other branches of industry; and, also, by opening extensive regions to a market which, without this cheap mode of conveyance, would be inaccessible.

These considerations show that canals, when considered by a comparison of their cost with the revenue derived from them, may be divided into two classes: 1st. Those which are made with a view to the general interest of the country, the revenue being a secondary object; and, 2d. Those on which the revenue is the principal object. The first can only be undertaken at the charge of the public Treasury; the other may be either the work of the Nation, of particular States, or of private associations.

The proposed Morristown canal belongs, from the manner in which the project originated, to the last class abovementioned: and, though it well deserves to be classed with those promising greatest *national* advantage, we shall nevertheless consider it only in the relation of the probable cost with the anticipated revenue. To establish this sort of comparison, it is necessary to state successively the particular

objects in view in proposing this canal, the income which will result from the attainment of these objects, the proposed manner of construction, and the calculated expense.

Of the objects in view in constructing the Morristown Canal.

This canal, following nearly an east and west course, is to unite the Delaware and Passaic rivers. It leaves the Delaware opposite Easton, Pennsylvania, or rather opposite the mouth of the Lehigh river, and keeps along the north side of the valley of the Pohatcuny river to about one mile to the northwest of the Brick Tavern, where it crosses this little river, and passes over to the north side of the valley of the Musconetcuny river; it then pursues its course along the north side of this valley, to Stanhope, where it crosses the Musconetcuny, and runs up the south side, near to Brookland, and within two-thirds of a mile of the south end of the Great Pond. Here is the summit level of the canal, to be filled by a feeder from the Great Pond, which is to supply both the eastern and western sections. Descending along the south side of the valley of the Rockaway river, it crosses that river about two miles above its junction with the Passaic; about one and a half miles further it crosses the Passaic itself; after which, it pursues nearly a straight line to the Little Falls; thence it runs straight, cutting off a bend in the river, for about two miles, when it descends into the bed of the river, which it follows to Paterson. At Paterson, the canal leaves the river, and, running nearly south, falls into the Passaic at Aquacknock, whence there is tide-water navigation to the city of New York.

Since the trace of the canal just described was surveyed, it has been ascertained that another, and probably a better, route may be found for a part of the eastern section, to wit: by crossing the Rockaway first at Dover, again one mile to the northeast of Colonel Glover's, and lastly at Scott's Forge; thence to the Pompton river, over the Pompton Plains, and after passing the Pompton river, keeping on the north side of the Passaic, and dropping into it two miles, about, below the Little Falls. This proposed change is shown on the map herewith, by the dotted red line.

The Morristown canal, as appears by the above delineation, is a summit level canal, deriving its supply of water, for both sections, from the Great Pond. The surface of this pond is about two square miles, and the annual supply of water is stated to be 55,021,991 cubic yards. The elevation of its surface is 902 feet above the tide of the Passaic, and 753 feet above the surface of mean water in the Delaware at Easton. The bottom of the canal on the summit being fourteen feet below the surface of the pond, the descent into the Passaic will be 888 feet, and into the Delaware 739 feet. The total length of the canal will be about seventy-six miles: the summit level being just about midway.

The map accompanying this report makes it unnecessary to give a more minute description of the location of the canal. Upon the map are shown the trace, the different levels, their respective elevations above the Passaic and Delaware, the several falls from level to level,

the streams crossed in the route, and the general relation of the trace to the several rivers and smaller streams of the country.

The chief object of the Morristown canal is to open a communication between the great beds of coal (anthracite) on the Lehigh river, and the iron works of New Jersey, the manufactories at Paterson, and the city of New York.

The Lehigh is now navigable to within nine miles of the coal beds, from which point a sort of railway extends to the quarries; and coal can be delivered at Easton (at its mouth) for \$3 94 per ton. Reckoning \$2 62½ for the toll and transportation to New York, the total price at that city will be \$6 56 per ton. Deducting from this the transportation from the end of the canal in the Passaic to the city, there will remain \$5 50, as the highest price for coal furnished to the forges in New Jersey, and to the works at Paterson.

As the ton of Liverpool coal costs \$10 50 in New York, and that of the Lehigh can be furnished at \$6 56, there will be, in this point of view, a saving of \$3 94 per ton; and there being 45,000 tons imported annually, the yearly saving to the city will be 178,500 dollars. Here it should be remembered that the whole sum of 472,000 dollars, now paid for Liverpool coal, will be retained in the country, to the advantage of the nation at large. This diminution of price, while it will effectually exclude foreign coal, will greatly increase the consumption of that brought by the canal. But this economy in the price per ton is not the only saving which will accrue: for the results of chemical analysis, and also of trial, give to the Lehigh anthracite nearly twice as much of the principle of combustion as to the Liverpool coal; or, in other words, they prove that one ton of the former is worth two of the latter; thereby giving an economy of \$14 44 for every ton of anthracite consumed. The above calculations make it obvious that, when once the Morristown canal is in operation, the Lehigh coal must come into general use, not only as a substitute for all foreign coal, but also for wood, which must annually increase in price, and which is now not very different in that respect from Liverpool coal.

The results will be analogous as to the iron works of New Jersey. At present charcoal only is used, because the high price of land-transportation forbids the use of the mineral coal. The proprietors of the forges and furnaces find it indispensable to an economical management of their concerns, to own extensive tracts of woodlands in the vicinity of their works, and make their own charcoal. These forest lands absorb more than two-thirds of the whole capital; that is to say, if a single forge requires a capital of 8,000 dollars, the woodlands necessary to supply this forge with fuel will cost at least 16,000 dollars. This necessary weight of capital, of course, goes to increase the price at which they can afford to sell the manufactured article. But, besides, the gradual clearing of the country, by an increasing population, and the consumption of the forges themselves, so enhance the price of wood, that the time may come when the working the mines and carrying on the manufactories of iron will entirely cease. This

period can, indeed, hardly be considered as distant, when we see annually a diminution in the number of forges. Of ninety-three forges in the county of Morris, thirty-nine are at this moment extinct for want of fuel.

By supplying these forges with good fuel, at a fixed, and, compared with the present, a very moderate price, there will result : 1st. A reduction in the capital necessary for the establishment of a forge ; so that, with the same amount as is now invested, there may be three times as many forges, and, consequently, three times as much iron made. 2d. A reduction in the price of the manufactured iron, both on account of the greater cheapness of fuel, and of the diminution of capital necessary to produce a given quantity. 3d. A greater activity in working the rich and numerous mines of the vicinity. And, 4th, a reduction of the quantity of imported iron ; this being a certain consequence of the cheapness of fuel, the vicinity of the ore, the good quality of the iron, the abundance of water power, and the communication, by a canal, with a market. It is proper to notice here, that a ton of New Jersey iron is now worth, in New York, about seventy dollars ; but that, if the forges were well supplied with the mineral coal, and the transportation to the city could be made by a canal, it could be sold for fifty-five dollars. A ton of Swedish iron costs, in New York, ninety dollars, and the annual importation amounts to ——— tons.

On the above considerations, it is easy to perceive how much the consumer in particular, and the nation at large, will benefit by the impulse which will be given to the Jersey iron-works, by the successful operation of the Morristown Canal. We must not, however, omit to state, while on this subject, that supplying the forges with coal from the Lehigh, will give a large extent of country now devoted to furnishing charcoal, to be appropriated to agricultural purposes—thereby greatly increasing its capacity for population, and its disposable productions.

The Morristown canal will not only traverse the rich iron region of New Jersey, but will also communicate directly with the flourishing manufacturing village of Paterson. Great as are the advantages of this situation, for its abundant supply of water power, its proximity to the rich emporium of New York, and its water communication with the city, it is certain that these advantages will be greatly enhanced by the execution of the project under consideration. At present its operations are confined to wool, cotton, hemp, &c. ; but once furnish to that enterprising village the ores and coals of the interior, and the additional water power and greater facility of transportation to be derived from the canal, and we may look thither for the supply of the numerous articles of wrought metal for which so much is now paid to foreign, to the detriment of native skill and industry.

Such are some of the immediate advantages appertaining to the projected Morristown canal ; but there are others to be pointed out, scarcely less important : of these, some will contribute to the revenue of the canal from the moment of its completion, while others only

promise to become fruitful sources of profit hereafter. Besides the transportation of ores and coal upon the canal, there is to be added the transportation—1st. of iron to the city of New York; 2d. of the products of agriculture; 3d. of lumber from the Delaware; 4th. of the trade between Easton and New York; 5th. of lime for agricultural purposes, from the western to the eastern sections; 6th. of lime for the New York market; and, 7th. of the several articles furnished by the city to the interior of New Jersey. As to the future: First, it cannot be unreasonable to anticipate, from the low price at which the Lehigh coal will be delivered in the city of New York, and from its excellent quality, that its use will be very greatly extended, both to the east and to the north of that city; and, secondly, a cut of about twelve miles will connect the waters of the Lehigh with the waters of the Susquehannah, and thus (with the improvement of the navigation of those rivers) open a direct communication between New York and all the upper basins of the Delaware and Susquehannah rivers; that is to say, with an extent of country of more than 36,000 square miles.

Estimate of the Revenue of the Canal.

Embracing only those objects which will begin to contribute to the revenue from the instant of the completion of the canal, and estimating them at the lowest rate, we obtain the following *minimum* revenue.

The principal article transported upon the canal will be coal from the Lehigh, for the supply of the city of New York. That city and the village of Brooklyn, contain 135,000 inhabitants. But the only means of approximating to the consumption of coal by this population, is, by comparing it with other cities in a similar climate, where coal is the principal fuel.

Dublin contains 144,000 people, its ann. con'n of coal is	204,000 tons
Edinb. and Leith 100,000 do do	213,999

Total	244,000	417,999
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This gives for each inhabitant a mean annual consumption of 1.715 tons, and for 135,000 inhabitants 231,255 tons. But as the Lehigh anthracite contains about twice the principle of combustion which the coal in use in the cities we have chosen for comparison contains, we will reduce the quantity found above one-half; that is, to 115,627 tons. This consumption may be regarded as a minimum: for neither the quantity required by manufactories in the neighborhood, nor by steamboats, is included. The above calculation gives to each person 0.857 ton per annum, which, at \$ 6 56 per ton (as stated before) will require for a family of ten persons, an annual expense of only \$ 56 22.

115,627 tons of coal, transported to New York, at 1½ cents per mile per ton, or \$ 0 95 for 76 miles per ton, - \$ 109,845

The Morris county forges and furnaces in actual operation are 54 in number, making, at two fires each, 108 fires; these should produce, if properly supplied with ore and coal, 50 tons of iron each, or 5,400 tons in the whole. Reckoning 7½ tons of coal to 1 ton of iron, they will consume 40,500 tons of coal.

40,500 tons of coal, transported to the above forges, at a mean distance of 48 miles, at $1\frac{1}{2}$ cents per mile per ton, or \$0 60 per 48 miles per ton, is - - - 24,300

In the same district are 39 forges and furnaces extinct for want of fuel; these being of the largest class, may be averaged at $2\frac{1}{2}$ fires each, making in all 97 fires; which, at 50 tons per fire, will make 4,850 tons of iron. and at $7\frac{1}{2}$ tons of coal per ton of iron, will require 36,375 tons of coal.

36,375 tons of coal. at \$0 60 per ton - - - 21,825

The iron made in the above works will all be sent to New York.

10,250 tons of iron, at \$0 60 per ton, will give - 6,150

6,000 tons of ore. (a part being sent to the works by land,) conveyed a mean distance of 24 miles, at $1\frac{1}{4}$ cents per mile per ton. or \$0 30 per ton for 24 miles will give - 1,800

Paterson, Newark, Elizabethtown, and the other villages and settlements within reach of the canal, will require, either in the families or in manufactories, say one-third as much as New York.

40,000 tons of coal, transported a mean distance of 48 miles, at $8\frac{1}{4}$ cents per mile per ton, or \$0 60 per 48 miles per ton - - - 24,000

The valleys of the Musconetcony and Pohatcony furnish an abundance of lime, of which none is to be found east of the summit level. The canal will furnish facilities for transporting this matter, so necessary in agriculture, to the eastern section.

5,000 tons of lime transported a mean distance of 32 miles, at $1\frac{1}{4}$ cents per mile per ton. or 40 cents for 32 miles per ton 2,000

At present a great quantity of the productions of the farms and forests of New Jersey cannot be sent to market, because of the high price of land-carriage. The opening of the canal will reduce the price of transportation so low that we may estimate at least 13,000 tons of this produce, as passing along the canal to New York.

13,000 tons of this produce, sent to New York from a mean distance along the canal of 44 miles, at $1\frac{1}{4}$ cents per mile per ton, or 55 cents for 44 miles per ton - - - 7,150

The commerce between the parts of the State bordering the canal and the city of New York. is, on one part, in cider, spirits, bricks, rails, &c. and on the other, in salt, gypsum, dry goods, &c.; this may be valued at 10,000 tons.

10,000 tons, transported a mean distance of 56 miles. at $1\frac{1}{4}$ cents per mile per ton, or 70 cents per ton, for 56 miles 7,000

Paterson will use the canal for the conveyance of the raw materials from, and the manufactured articles to, the city of New York; this is estimated to amount now to 1,950 tons.

1,950 tons, at 30 cents per ton - - - 585

The canal will put Easton in communication with the manufacturing at Paterson and the city of New-York ; the commerce which will result may be estimated at 9,520 tons.

9,520 tons. for a mean distance of 64 miles, at $1\frac{1}{4}$ cents per mile per ton, or 80 cents per ton for 64 miles - - - 7,616

The lumber which comes down the Delaware from above Easton is stated at 5,000 tons ; half of this may be supposed to pass through the canal to New York.

2,500 tons of lumber, at 80 cents per ton - - - 2,000

290,722 tons - - - - - \$ 214,271

As the above estimate gives 290,722 tons of trade, and \$ 214,271 of revenue as a minimum, it is believed to be superfluous to enter further into this particular subject. But, before leaving it, we cannot refrain from observing that all the articles above estimated are susceptible of continual augmentation, and that the day may arrive when the projected canal will, alone, be inadequate to the trade requiring this species of accommodation.

Of the proposed manner of construction.

To this subject belong the profile of the canal, the number of locks it will require; the expense of water, the time necessary for the passage from the Delaware to the Passaic, and both the first cost and that of yearly repairs. The dimensions of the canal, in breadth and depth, are generally determined by the object it is to accomplish. A canal uniting two bays, for example, should permit the passage of the ordinary craft navigating these bays ; and so of rivers. But it often happens that a want of water, or a deficiency in capital, or the certainty of a small amount of revenue, make it necessary to abandon the above principle, and adopt much smaller dimensions. This reduction, however, has its limits, beyond which stability is compromised, the passage of boats retarded, and animal labor badly applied.

Considered in every point of view, the profile herewith, which has been adopted by Mr. Renwick, who, as the Engineer, has explored the route, located the canal, and made all the plans of construction, is all that can be desired.

1st. The slope of 2 to 1, given to the sides, assures a perfect solidity, and by diminishing the effect of the waves upon the bank, permits to give to the boats a velocity which would otherwise speedily wear away the banks. In broad canals, the slope may be proportional inversely to the tenacity of the soil ; but where the banks can be abraded at all, this will not do in narrow ones, in which the preservation of the slopes, and the velocity of the boats, are primary objects.

2d. The breadth at the bottom being fourteen feet, two boats, of eight and a half feet beam, (there being one foot water more than their draught) may pass each other without touching.

3d. The depth being at least four feet, a boat, drawing three feet, with eight feet beam, which gives a profile of about twenty-two square

feet, will occupy but one-fourth of the profile of the canal, which is 88 square feet; a less difference between the two profiles would increase the resistance of the water, and, consequently, require a greater hauling power for the same velocity; besides this, the excess of depth over the draught, will prevent boats from injuring the canal by disturbing the bottom; and it will also permit water to be drawn from any particular level for filling locks, without requiring recourse to be had in any case to the water of the summit level. A depression of one inch in a level of one mile in length, will fill a lock nearly three times; and in a ten mile level, it will fill twenty-eight locks.

4th. The towing path having eight feet breadth, one and a half feet elevation above the water, and an exterior slope of 45 degrees, is perfectly adapted to the kind of canal contemplated.

5th. All the above dimensions being determined, with reference to the size of the boats; to the best form, as respects the stability of the banks; and to strict economy in the first cost of the canal, they may be regarded as giving a minimum quantity of excavation. Supposing the ground to be level, an excavation of three feet deep will suffice, and will give for each running yard 6.66 cubic yards of excavation; the embankment amounts to 6.52 cubic yards.

It has been said that the profile of the canal is calculated for a boat of eight and a half feet beam, and three feet draught. By giving sixty feet length to this boat, its burthen will be twenty-five tons, which has been found to be the most advantageous load for a single horse. A boat of these dimensions may navigate the Passaic from the entrance of the canal to its mouth; but it will be too small for the navigation thence to the city of New York, in rough weather, and too large for the upper Delaware and its tributaries: the Durham boats, or these last, draw but two feet, with a full load of fourteen tons; and the periaugers, which run from the Passaic to the city, are about forty tons. It would be better, no doubt, if the canal could be made to receive such boats as could safely navigate the bay of New York: for then the passage through would be more rapid and cheaper; but the consideration of a much heavier first cost, and of the advantage to the State of New York, of having a place of deposit and transshipment at each extremity of the canal, forbid to hope that dimensions, in all respects suitable to the importance of the communication, will be given to it.

The dimensions of the boats being fixed, those of length and breadth determine the horizontal dimensions of the locks; that there may be room for the boat, and for the play of the gates, these should be nine feet by sixty-four feet. As to the lift of the locks, it is fixed at eight feet, being that which is most commonly preferred. A system of locks with less lift, say four feet for the same total rise, of suppose 120 feet, will require an expense of construction of about one-half more than locks of eight feet lift; and while the expense of water will be one-half less, the time required for the passage will be one-third more. For this same total rise of 120 feet, with a system of locks of twelve feet lift, the expense of construction will be only about one-sixth less than for eight feet locks; and while the expense of water will be one-half

more, the time of passage will be about one-quarter less. These considerations of cost of construction, expense of water, and consumption of time, have led to the choice of eight feet lifts, as a sort of mean between the advantages and disadvantages of greater and lesser lifts.

Adopting this fall of 8 feet, the number of locks on the Morristown canal is ascertained by adding the whole rise from the Passaic to the summit level, viz : 888 feet to the descent from the summit to the Delaware, to wit : 756 feet ; giving a total of 1,644 feet, which, divided by 8, the number of feet fall in each lock, gives $205\frac{1}{2}$ locks. This number of locks, compared with the length of the canal, 76 miles, is excessive, and much greater than in any canal hitherto constructed. The canal of Languedoc is 150 miles long, and has 101 locks ; and the great Western canal in the State of New York, will have only 80 locks in its whole length of 360 miles.

The great expense of such a system of locks in first cost, in water, and in time, would have been fatal to the project ; but, happily, the science and ingenuity of Mr. Renwick, aided by the success of analogous attempts in Europe, have found out an expedient by which this formidable elevation of the summit may be overcome, at a comparatively small expense. His idea is, the combination of locks and inclined planes, or rather the use of either, as local circumstances may dictate. The plan of Mr. Renwick, bold, ingenious, and novel, promises such improvement in the mode of passing from one level to another, and, indeed, such a facility in overcoming obstacles, which, in the existing mode, might be regarded as insuperable, that we consider it our duty to enter with some minuteness into its details. It will be proper first, however, to examine the consequences which will result from adopting the 206 locks ; so that we may know accurately whether the objections to these locks are as great as they at first appear. This examination, as the construction of locks will be much more expensive than the inclined planes of Mr. Renwick, will be attended with the advantage of exhibiting the canal in the most unfavorable point of view.

In respect to the expense of water, we will observe, that a boat leaving Easton for the Passaic, will require two lockful of water for the passage ; one in ascending the Western, the other in descending the Eastern section. But if, on arriving at the summit, this boat meet another, just ascended from the eastward, the lock which has been filled for the ascent of that boat, will serve for the descent of this ; in this case, the expense will be but one lockful. The greatest quantity, therefore, that this boat will require, will be two lockful ; and the least, one lockful. But it is further to be observed, that, from the nature of the trade upon the canal, whether the boats are loaded or empty, the number going one way, will be about equal to those going the other ; and that the empty boats might be obliged to wait the arrival of loaded boats from the opposite direction, or, which would add to the revenue, to pay as much toll as if loaded ; though, on this plan, one lockful might be taken as the real expense of water in the passage of each boat. We will suppose, for the sake of having the esti-

mate higher than is absolutely necessary, that the expense of water by each boat is one lockful and a half. This established, it is easy to estimate the total expense of water. Each lock being 9 feet broad, 64 feet long, and 8 feet deep, will contain 170.66 cubic yards, and one lock and a half 256 cubic yards; this must be reduced to 201 cubic yards, by deducting 55 cubic yards, for the water displaced by a loaded boat—that is, in one lockful, the boat displaces 56.66 cubic yards, and in one and a half, 55 cubic yards. The number of tons of trade has been stated at 290,722, and as each boat is to carry 25 tons, there will be 11,629 boat loads, which, at 201 cubic yards per boat, will give, for the annual expense of water, 2,337,429 cubic yards. It now remains to add to this loss of water, that which goes off by evaporation, that which is lost by leakage through the gates, and that required to fill the canal at each annual opening of the navigation.

The evaporation from any given surface of water, varies with the temperature, with the winds agitating the surface, and with the elevation above the level of the sea. In warm climates, water has a greater tendency to assume the state of vapor than in colder regions; the air in contact being more rarified, and opposing less resistance to the disengagement of the vapor. At a high elevation, above the level of the sea, the atmosphere is less dense, and presses less heavily upon the surface of the water, and every thing else being equal, resists less the escape of the vaporised particles; and, where the atmosphere is agitated by winds, the vapor is carried off with great rapidity by the continual succession of portions of dry air. From these remarks, it will appear, that, to know with precision what is the evaporation at any particular place, there should be a series of daily observations made upon the spot, and extended through several years. Similar observations should be made of the annual quantity of rain, so that there might be a ratio established between the rain and the evaporation. We know of no such observations having been made in New Jersey; and as we have not time to obtain the results of those made in other parts of the Union, we find ourselves restricted to very few and partial results, as respects this country, and forced to rely mainly on those belonging to other countries. Though the conclusion will not be rigorously exact, it will, nevertheless, suffice for the object now in view.

Observations made in this country, and compared with similar ones in Europe, shew, that though there are fewer rainy days here, the quantity of rain is greater than in Europe. The comparisons of Dr. Holyoke give 122 rainy days as the mean of 20 years, in twenty cities, of Europe; and 88 rainy days per year for Cambridge, Massachusetts. At the same time that the number of rainy days in Europe exceeded those in the United States by 34, the quantity of rain was found to be one-third less there than here. Evaporation is also found to be greater here than on the old continent. Mr. J. Williams gives 56 inches per annum for Cambridge, while the mean for seven German and Italian cities was only 49 inches; and the mean of four observers in England, each including at least three years, was 36.45 inches. We

have found that 35 inches of rain was observed to fall per year, at Salem, Massachusetts; and supposing the same quantity to fall at Cambridge, the rain there is to the evaporation as 35 to 56, which is a near approximation to the ratio of 3 to 5, (or 30 to 50,) given by Halley, and to the mean ration of 26.87 to 41.52, which we have found from an analysis of the results of seven observers in Great Britain and France. The first ratio above, expressed in simplest terms, is 1 to 1.60; the second, 1 to 1.66; and the last, 1 to 1.54. The rain at Philadelphia is stated to be 30 inches; at Salem, it is 35 inches; and we infer, that, in New Jersey, it may be 32 inches. Applying to this quantity the first ratio above stated, the result is about 51 inches of evaporation per annum; which exceeding the rain upon the surface of the canal by 19 inches, these 19 inches might be considered the real loss of water; but the canal can only be navigated during those eight months of the year (from April to December) when the evaporation will be greatest, and the rain least; and the instruments in use for measuring evaporation, must always give results below the truth, from their not being exposed to winds and currents of air. We, therefore, adopt the whole sum of 51 inches, as expressing the maximum loss of water by evaporation. The canal being 76 miles, or 133,760 yards in length, and ten yards in breadth, on the water line, its surface will be 1,337,600 square yards, which, multiplied by 51 inches, or 1.417 yards, will give 1,895,379.2 cubic yards, as the whole loss by evaporation.

Filtration through the banks and bottom of a canal, causes a loss of water which is by no means easy to estimate, depending, as it does, as to quantity, not only on the manner in which the masonry and the earth embankments are constructed, but upon the nature of the soil, which can only be known by actual excavation. If the earth is of clay, if the embankments are well shaped, well rammed, and of proper dimensions; if the masonry is executed with care, and on foundations well secured; then the loss of water will be the least possible; but experience has shown, that, with all possible precautions, this loss will be considerable, especially for several of the first years, and that time alone can put an entire stop to the leakage. From allowances made in France, which seem to have been in accordance with the results, we take, as the least which it will be safe to adopt, 60,000 cubic yards per mile for the annual loss by filtration. And 60,000 multiplied by 76 (the number of miles) gives 4,560,000 cubic yards.

In the above product is not included the leakage through the gates of the locks, which remains to be calculated. As we are now considering the canal as having a series of locks, we must reckon only the leakage of the two gates at the extremities of the summit level; because the loss, at the inferior gates, on both sections, will be supplied by the loss of these two upper locks. It has been shown by the experience of canals in operation, that the loss is about two locksful at each of these gates, making four locksful as the total loss per day. Each lock containing 170.66 cubic yard, this daily loss will

amount to 682.64 cubic yards; supposing the navigation to be open for eight months, or 240 days, if we multiply the 682.64 cubic yards by 240, we obtain 163,833.6 cubic yards, for the annual loss by leakage by the gates.

Before we attain the whole consumption of water by the canal, we have still to consider that, as the canal will be left dry during the Winter, it must annually be filled at the expense of the feeder. The profile of the canal being 88 feet or 9.777 square yards, and its length 76 miles or 133,760 yards, the total content will be $(133,760 \times 9.777)$ 1,307,771.5 cubic yards.

Recapitulation of the quantities of water used and lost by the canal.

1st. For the passage of boats	-	-	cub. yds.	2,337,429
2d. For evaporation	-	-	-	1,895,379.2
3d. For filtration through the banks and bottom	-	-	-	4,560,000
4th. For leakage at the gates	-	-	-	163,834.6
5th. For filling the canal every Spring	-	-	-	1,307,771.5

Total annual consumption of water, cub. yds. 10,264,414.3

From measurement made by Mr. Renwick of the water passing out of the Great Pond, it seems there is an annual supply of 55,021,991 cubic yards, without reckoning that which passes through its badly constructed dam. By making this dam tight, and raising it three feet, the water in the pond, which has an area of two square miles, or 6,195,200 square yards will be augmented 6,195,200 cubic yards; which amount, added to the 55,021,991 cubic yards, gives for the supply of the pond - - - cub. yds. 61,217,191

Deduct the quantity required by the canal, viz: 10,264,414

and there remains a supply of - - - cub. yds. 50,952,778

A surplus greatly beyond the present or probable wants of the country.

In calculating the time required to make the passage of the canal, we will neglect the lengths of the locks, which make, together, 4,394 yards, and consider the length of the canal to be 76 miles, independent of the locks. At the rate of four miles per hour, which experience upon the New York canals has fixed as the maximum velocity, this distance will be accomplished in nineteen hours.

As to the time which will be taken to pass the locks, we will assume the maximum given by experience, viz:

1st case. A descending boat, finding the lock full, six minutes. $\left\{ \begin{array}{l} 1\frac{1}{2} \text{ to enter,} \\ 3 \text{ to fill,} \\ 1\frac{1}{2} \text{ to leave the lock.} \end{array} \right.$

2d case. A descending boat, finding the lock empty, nine minutes. $\left\{ \begin{array}{l} 3 \text{ to fill,} \\ 1\frac{1}{2} \text{ to enter,} \\ 3 \text{ to empty,} \\ 1\frac{1}{2} \text{ to leave the lock.} \end{array} \right.$

3d case. An ascending boat finding the lock empty, six minutes. $\left\{ \begin{array}{l} 1\frac{1}{2} \text{ to enter,} \\ 3 \text{ to fill,} \\ 1\frac{1}{2} \text{ to leave the lock.} \end{array} \right.$

4th case. An ascending boat finding the lock full, nine minutes. $\left\{ \begin{array}{l} 3 \text{ to empty,} \\ 1\frac{1}{2} \text{ to enter,} \\ 3 \text{ to fill,} \\ 1\frac{1}{2} \text{ to leave the lock.} \end{array} \right.$

The mean of these four cases is seven and half minutes, which, being multiplied by 206, the number of locks, gives twenty-five hours and forty-five minutes for the time required to pass the locks; adding this to nineteen hours, we have forty-four hours and forty-five minutes, or reckoning twelve hours per day, nearly four days for the voyage from the Delaware to the Passaic.

Considering the canal as having locks throughout, it now only remains to examine into its cost. The estimate provided by the Engineers, so far as it can be applied to our present supposition, will be given below; and, in adopting this estimate, we think it important to state, explicitly, that we believe it to be fully adequate, in all respects, to the construction of the canal; taking, for example, the excavation and the embankment we find it estimated at \$ 230,184 $\frac{1}{2}$, whereas, on the supposition that the ground is level and uniform, the profile before given, multiplied into the length, gives 890,841.6 cubic yards, which, at 8 cents per cubic yard, the price of ordinary excavation on the New York canals, amounts to only \$ 71,267 33; not quite one-third of the sum allowed by the Engineers. The excess of \$ 158,916 67, is, undoubtedly, ample to meet all expenses of deep and difficult cutting, and of embankments; all the other items of the estimate seem to us equally liberal. The following is a summary of the estimate.

Excavation and embankment,	For the western section,	85,258	$\left. \begin{array}{l} \\ \\ \end{array} \right\}$	\$230,184 00
	For the feeder from the great pond.	3,500		
	For the eastern section,	141,426		
Masonry,	For aqueducts and culverts,	42,287,	$\left. \begin{array}{l} \\ \\ \end{array} \right\}$	701,487 00
	For the 206 locks, which our present examination supposes at the rate of \$ 3.200 for each, or \$ 400 a foot lift,	659,200		
150 Bridges at \$ 100,	-	-	-	15,000 00
76 Miles of grubbing, \$ 200,	-	-	-	15,200 00
76 Miles of fence, \$ 480,	-	-	-	36,480 00
Expense of engines and superintendents, 5 per cent.				49,917 55
Contingent expenses, 10 per cent.				99,835 10

Total expense of the canal, with an entire system of locks, - - - - \$ 1,148,103 65

This total of expense being on the supposition of the use of locks throughout, must be considered the maximum; because we shall

soon see that, by substituting the inclined planes, invented by Mr. Renwick, and using locks only where the fall is too low to admit inclined planes, there will be a saving of 281,600 dollars. The cost of the land is not here estimated, as it is supposed that the owners, sensible of the advantages of having a canal at their doors, will demand little or nothing for it. At any rate, the cost cannot be much : for taking the breadth occupied by the canal and its embankments, at 19 yards, the quantity required will be but 526 acres.

On comparing this maximum expense, with the minimum revenue, which we before obtained, viz : 214,271 dollars, (see page 99,) we find that the investment will yield $18\frac{2}{3}$ per cent. per annum ; and on the supposition that the cost of annual repairs and superintendence will amount to 1,000 dollars per mile, or 76,000 dollars, the nett revenue will be 138,271 dollars, yielding a little more than 12 per cent. per annum.

From the considerations above stated, we come to the conclusion that, even with an entire system of locks, there are no real difficulties in the way of the proposed canal, whether we regard the cost, the supply of water, or the time required for the passage ; and that the profits of such a canal may reasonably be expected to amount to 12 per cent. on the capital.

We pass on now to an examination of the proposed canal, in the most favorable point of view ; that is, as it appears under favor of the ingenious invention of Mr. Renwick.

Fixed locks were for a long time the only means in use for getting over the elevations in the routes of canals ; but, although they are certain and safe, where there is a sufficiency of water, experience and reflection both, show that they are inapplicable, where the quantity of water is small ; and inadmissible, where the elevations are so considerable, as to extend the cost of construction, and the time of making the passage beyond certain limits. Even in cases where they are advantageously applied, there is this inherent objection, that they require more water to pass a boat, than is sufficient to float the boat. In passing, for example, from the level S to the level I, the quantity *a b c d*, being of equal section with the canal, is sufficient to float the boat ; but this must be sustained by the quantity *e d e f*, which is of no other use, and which is lost by being necessarily drawn off by the lower level. Means have been devised for correcting this fault, but as we only advert to this matter with a view of comparing common fixed locks with Mr. Renwick's invention, it is necessary to detail them.

Several engineers of reputation have occupied themselves with researches as to proper substitutes for locks, in cases where these can only be applied disadvantageously. Messrs. Fulton, Leach, Reynolds, Deckart, Anderson, Rowland, Pickering, Welden, and the Duke of Bridgewater in England, and Solages, Bossut, and Forcy, in France, have severally proposed plans of this nature ; and some of them have been carried into successful operation. Reynolds constructed at Retley, in Shropshire, an inclined plane, with two parallel iron railways ; a loaded descending boat, by means of rope pass;

ing round a wheel at the upper end of the plane, drew up a half loaded boat. On the Duke of Bridgewater's canal, is an inclined plane, analogous to the above, in full operation. On the Ellismere Canal in Denbighshire, Rowland and Pickering constructed a movable lock, with a vertical lift and counterpoise. Mr. Weldon employed nearly similar means in the coal canal near Bath; and, lastly, a movable lock, on similar principles with the last, was successfully applied by Forcy, on the plans of Bossut and Polages, to the "Canal du Crensoy" in France. The expedients proposed by these engineers are of two kinds. First, inclined planes, with parallel railways, on which the boats ascend and descend alternately; and, secondly, vertical lifts, working in a similar manner. Either of these expedients is applied, and sometimes both, as local circumstances may require.

The invention of Mr. Renwick, is of the first kind. It is an inclined plane, on which are fixed two parallel sets of iron railways, (see plan, profiles, &c. herewith.) each set serving for a lock to ascend and descend. The lock is supported upon, and moves with a carriage, the top of which is horizontal; the bottom being parallel with the inclined plane; under the bottom of the carriage and securely fastened to it, are a number of iron truck wheels, in two rows, corresponding with, and revolving along, the railway belonging to the lock: two strong chains are secured to and passed round a drum at the end of the upper level; the other parts being brought down and fastened, one on each side, to the lower part of the lock. As each of these chains is strong enough to sustain a loaded lock, all danger of accident during the transit is guarded against. The two locks used by Mr. Renwick on his inclined plane are precisely alike in all respects. But as there are two cases likely to occur in the application of this invention, requiring different methods of giving motion to the locks, it is necessary to describe the method devised for each. 1st—The case when the triangular space between the end of the lower level, and the lower part of the inclined plane can be kept dry by draining. On this supposition, it will only be necessary to have a drum at the end of the upper level, extending across both railways, to wind the chains of one lock around this drum in a different direction from the chains of the other lock, and to have the chains of one lock wound up entirely, and the lock at the top of the plane, while the other chains are unwound, and the lock at the bottom. Such being the arrangement, it is obvious, that, by permitting the escape of a little water from the lower lock, the upper will preponderate, and, by descending and turning the drum, wind up the chains, and, of course, draw up the lower lock. This will, however, be an accelerating motion, unless water is permitted to escape gradually from the descending lock; because the lengthening the chain in the one lock, and the shortening that in the other, continually increase the preponderance of the descending lock. 2d—The case where from there being no lower ground near, the triangular space must be kept full of water. Here the above simple arrangement will not answer; because the moment the descending lock enters the water of the triangular well, it

loses in relative weight, and soon ceases to preponderate. To surmount this difficulty, Mr. Renwick has introduced the very ingenious device shewn in the plans (figs. 5 and 1:) instead of a drum common to both locks, there is one for each lock, and each drum is provided with two spur-wheels of different diameters; the two small wheels of the two drums, are, however, alike as to diameter and number of teeth, as are the two larger wheels. The intention of this contrivance is, that, by gearing the large wheel on the drum of the lock about to descend, with the small wheel on the other, the descent of one lock to the edge of the water will draw up the other, the whole length of the plane; because a given number of revolutions of the larger, will produce a greater number of revolutions in the smaller wheel, and, of course, in the drum, on which the chains are wound. But the descending lock, after effecting a complete transit of the ascending lock, has still a short descent to make before arriving at the end of the lower level; this is done by ungearing the drums entirely, and letting the lock descend by its own weight; taking care, however, to check this motion properly, in a way not unlike that of checking the chain cables of ships.

The passage of boats from one level to another, on this plan is a very simple operation in either of the cases stated above. A boat arriving at either end of the inclined plane, passes at once into the moveable lock, which, being fastened to the end of the canal level, is, as it were, a prolongation of that level; the gates are then shut, and the transit takes place, whether there be a boat in the other lock or not.

Before comparing the expense of these moveable locks, with that of fixed locks, we must observe that the correctness of the principles on which this invention depends, and the success of like contrivances in Europe, leave no reason to doubt of its perfect fitness to the object in view, and of its great utility.

A just comparison of these with ordinary locks, requires an examination of the cost of construction, the loss of water, and the consumption of time. From Mr. Renwick's estimate it appears, that a foot lift of the inclined plane, with its iron railways, and the chains for the locks, costs

	\$133 68
The moveable lock	\$824 00
The masonry, wood work, and machinery, at the top and bottom of the inclined plane	2,312 00
	<hr/> \$3,136 06

The first sum above stated must, in each case, be multiplied into the number of feet lift, required for the inclined plane; the second, being a constant quantity, is to be added to that product for the whole expense; as one of these is a constant, and the other a variable quantity, the price, per foot, lift, will be variable, diminishing, continually, with the increase of the number of feet in the lift; and, as the constant quantity is considerable, it will be found that, at short lifts, the advantage, as to expense, will be in favor of fixed locks; but the inclined plane is inapplicable, where the length does not exceed a certain quantity; and it will be found, by consulting the following table, that there will be considerable economy in its use, from the

moment the fall is great enough to admit its application. It will also be seen, on reference to the table, that the price of fixed locks per foot rise, (with a given lift to each lock,) is constant; and that, for 48 feet of rise, the whole expense is about twice, and for 120 feet, about twice and a half as much as that of moveable locks. The table is calculated on the supposition that the inclined plane makes an angle of 14 degrees twenty-eight minutes and forty seconds with the horizon, or, in other words, that the vertical rise being one, the length of the incline plane is four.

Table shewing the comparative expense of moveable and fixed locks from 8 to 152 feet rise.

Number.	Vertical height of the inclined plane.	Length of the inclined plane.	Price per foot lift of the inclined plane with moveable locks.	Total price of the whole lift with moveable locks.	Price per foot lift of common locks.	Total price of the whole lift with common locks.	Difference in total cost between fixed & moveable locks.
1	8	80	525 50	4,205 04	400	3,200	+1,005 04
2	10	96	447 23	4,472 50	400	4,000	+ 472 00
3	12	112	394 96	4,739 56	400	4,800	- 60 44
4	16	128	329 63	5,274 08	400	6,400	1,125 92
5	20	144	290 43	5,808 60	400	8,000	2,191 40
6	24	160	264 30	6,343 12	400	9,600	3,256 88
7	28	176	245 63	6,877 64	400	11,200	4,322 36
8	32	192	231 63	7,412 16	400	12,800	5,387 84
9	36	208	220 74	7,946 68	400	14,400	6,453 32
10	40	224	212 03	8,481 20	400	16,000	7,518 80
11	44	240	204 90	9,015 72	400	17,600	8,584 28
12	48	256	198 96	9,550 24	400	19,200	9,649 76
13	52	272	193 93	10,084 76	400	20,800	10,715 24
14	56	288	189 63	10,619 28	400	22,400	11,780 72
15	60	304	185 89	11,153 80	400	24,000	12,846 20
16	64	326	182 63	11,688 32	400	25,600	13,911 68
17	68	336	179 75	12,222 84	400	27,200	14,977 16
18	72	352	177 04	12,757 36	400	28,800	16,042 64
19	76	368	174 89	13,291 88	400	30,400	17,108 12
20	80	384	172 83	13,826 40	400	32,000	18,173 60
21	84	400	170 96	14,360 92	400	33,600	19,239 08
22	88	416	169 25	14,895 44	400	35,200	20,304 56
23	92	432	167 71	15,429 96	400	36,800	21,370 04
24	96	448	166 29	15,964 48	400	38,400	22,435 52
25	100	464	164 99	16,499 00	400	40,000	23,501 00
26	104	480	163 78	17,033 52	400	41,600	24,566 48
27	108	496	162 56	17,568 04	400	43,200	25,631 96
28	112	512	161 63	18,102 56	400	44,800	26,697 44
29	116	528	160 66	18,637 08	400	46,400	27,762 92
30	120	544	159 76	19,171 60	400	48,000	28,828 40
31	124	560	158 92	19,706 12	400	49,600	29,993 88
32	128	576	158 12	20,240 64	400	51,200	30,959 36
33	132	592	157 40	20,775 16	400	52,800	32,024 84
34	136	608	156 68	21,309 68	400	54,400	33,090 32
35	140	624	156 03	21,844 20	400	56,000	34,155 80
36	144	640	155 40	22,378 72	400	57,600	35,221 28
37	148	656	154 82	22,913 24	400	59,200	36,286 76
38	152	672	154 26	23,447 76	400	60,800	37,352 24

What has been said, is sufficient to shew the great advantage, as to economy, which these moveable locks have over the common fixed locks; and, in relation to comparative expense, it only remains to add, that this advantage will increase with the sines of the angles of elevation of the inclined planes, up to that degree of elevation which experience shall shew it will be hazardous to exceed.

The quantity of water used by these moveable locks, is the least possible, since they contain no more than is sufficient to float the boat, which, as has been said, is far from being the case with fixed locks. It is true that, if a moveable lock, having descended without a boat, receives a boat at the lower level to carry up, it will lose part of the water brought down; but this is compensated for, when the case is reverse; that is, when the lock having brought down a boat, is to ascend without one: for then the lock receives water from the lower to carry back to the upper level. The absolute loss for each transit being always only that which is permitted to escape from the lock at the bottom, that the lock at the top may preponderate sufficiently to overcome the friction of the track wheels.

As the moveable locks contain no more water than is necessary to float the boat, no time is lost, as is the case in fixed locks, in emptying and filling them. On the entrance of a boat, the water which it displaces, passes into the canal, and, on its exit, water rushes into the lock to fill the space it occupied: the trifling deficiency of water in the ascending boat, making no sensible difference. The time employed by a boat, therefore, in making a transit from one level to another, is consumed, first, in entering a lock; second, in moving along the inclined plane; and third, in passing out of a lock. Supposing the lift to be 64 feet, and the inclination of the plane 14 degrees 28 minutes 40 seconds, the length to be moved over by the boat, will be 250 feet, this might be passed very rapidly; but with a view to save the machinery, and to guard against accidents, and also to allow for the time required to adjust the locks to the end of the canal, and to regulate the preponderance of the upper boat, we take twenty feet per minute, as the velocity of the lock. On these suppositions, the time consumed will be as follows:

To enter the lock	-	-	-	-	-	-	-	1½
To move over the inclined plane	-	-	-	-	-	-	-	12½
To leave the lock	-	-	-	-	-	-	-	1½

Total 15½ minutes to rise 64 feet.

For the same length of 64 feet, with eight common locks, at 7½ minutes each, the time would be 60 minutes, or four times that required by moveable locks.

We might shew, in addition to the above striking general advantages, the great superiority of the moveable locks, in the case of a great and sudden descent, where common locks must necessarily be contiguous or near to each other; but we consider all further comparisons of this sort as superfluous.

It has been before stated, that the whole ascent and descent of the Morris canal is 1,644 feet, and that to pass the 206 fixed locks, which

that number of feet requires, would take 25 hours and 45 minutes, which, added to the 19 hours required to pass along the levels, gives a total of 44 hours 45 minutes, or, at 12 hours a day, $3\frac{2}{3}$ days. But, by combining the system of fixed locks with inclined planes, as Mr. Renwick proposes, the whole passage will be made in 28 hours and 50 minutes, or in $2\frac{1}{3}$ days, as will be seen below.

Along the route of the canal, there are several small depressions of level, in which fixed locks alone can be used, and the whole amount of these is 244 feet, leaving 1,400 feet for the inclined planes, giving 8 feet lift to the locks, and 64 feet to the planes; the time occupied in the passage, will be as follows :

For 244 feet lift with locks, requiring 31 locks, at $7\frac{1}{2}$ minutes each, is	H.	M.
	3	52 $\frac{1}{2}$
For 1,400 feet lift with planes, requiring 22 planes, at 15 $\frac{1}{2}$ minutes each, is	5	41
For passing along the levels (as before stated,)	19	
Total time,	28	33 $\frac{1}{2}$

The gain will, therefore, be $1\frac{1}{3}$ days on each passage.

We will now see what this will amount to, as regards economy of transportation, both with respect to the boats, and to the men, &c. employed with them.

Supposing 291,000 tons are to be transported from the Delaware to the Passaic, in 8 months, or 240 days, there will be 1212.5 tons per day; which, at 25 tons a boat, will require 48 boats to leave the Delaware daily. With a system of locks, $3\frac{2}{3}$ days will be consumed in reaching the Passaic; 1 day in unloading; $3\frac{2}{3}$ days in returning, and 1 day in taking in a new cargo, making $9\frac{1}{3}$ days; it will be necessary, therefore, if 48 boats are to leave the Delaware every day, to employ 9 times 48 boats, or, in the whole, 432 boats. But, with the system of inclined planes, combined with locks, $2\frac{1}{3}$ days will be consumed in the passage, 1 day in unloading, $2\frac{1}{3}$ days in returning, and 1 day in taking in a new cargo, making only $6\frac{2}{3}$ days: on the 7th day the boats might begin the second voyage, but we will suppose that they do not till the eighth, which will require 7 times 48 boats, or, in the whole, 336 boats: now as 336 is about the four-fifths of 432, it follows that there will result a saving of about 20 per cent. on the charter of the boats.

A like economy will result in regard to the men employed with the boats: for, in one case, 864 men must be employed during 8 months, and in the other only 672, to transport the 291,000 tons; giving a saving of about 20 per cent. in the hire of men. The consequence will be the same, also, as regards animal labor, and it is scarcely necessary to remark, that all these savings must diminish the price of freight in the same proportion.

It is proper, in this place, to ascertain what is the total amount of trade in tons, which can be passed through the canal in a year. Taking the day at 12 hours, and the number of days at 240, we will suppose that the first boat entering the canal, finds the river-lock full

(4th case, page 105) which will require 9 minutes for the passage ; the second boat, supposing an equal number of boats to pass each way, being obliged to wait 6 minutes for the descent of the boat, coming from the opposite direction, (1st case, page 104.) and requiring 6 minutes for its own passage, (3d case, page 105.) will consume 12 minutes in getting through the first lock ; the third boat will also consume 12 minutes, the 4th the same, and so on. Reckoning from the moment, the first boat is ready to enter, the following times will respectively elapse between that moment, and the complete transit of the several successive boats:

1st Boat	-	-	9 minutes.
2d do	-	-	9 + 12 minutes,
3d do	-	-	9 + twice 12 minutes.
4th do	-	-	9 + thrice 12 minutes, and

so on. Continuing the series, we find that the 60th boat will have completed her passage only after 9 minutes plus 59 times 12 minutes have elapsed, making 717 minutes, or 11 hours and 57 minutes ; sixty boats may, therefore, enter the canal in one day, at the same time, permitting an equal number to leave the canal. Sixty, the number of boats passing each day, multiplied into 240, the number of days, gives 14,400 boat loads ; which, multiplied by 25 tons, the weight of each load, gives, as the amount of trade, 360,000 tons per annum. This trade, from what has been said before, will require, with a system of locks, the employment of boats nine times 60, or 540 boats. Applying the same sort of calculation to inclined planes, we find, that, as a boat requires $15\frac{1}{2}$ minutes (according to our previous estimate, page 110.) to pass the average lift of 64 feet, only 46 boats can pass in a day of 12 hours, ($12 \text{ hours or } 720 \text{ minutes} \div 15\frac{1}{2} = 46.4$) and each being loaded with 25 tons, the whole amount of trade passed along the canal, will be 276,000 tons. Although this amount of 276,000 tons, is less than that which might be passed through a canal with locks, and less than the estimate of the anticipated trade, which we made 291,000 tons, (see page 99) the canal with inclined planes may still be considered fully adequate to this, and even a greater activity of transportation : because, in the above calculation, we assumed the day as of 12 hours length, whereas, in Summer, they extend to 14 and 16 hours. The transportation of the 291,000 tons, will employ 336 boats, 672 horses, supposing a relief of horses at one end of the canal, and 672 men and boys.

We have now to compare the expense of the two systems. The first amounts, according to the estimate given, (page 105) to \$1,148,103 65 : to obtain the other we suppose that an inclined plane of 64 ft. lift will answer as the mean of the whole, and we might take the sum of \$182 63 (found in the table) as the proper price ; but with a view of being above, rather than under the cost, we shall assume \$200 as the price per foot lift. On this assumption, the cost of the Morristown canal, with both locks and inclined planes, according to the plan of Mr. Renwick, will be as follows :

Excavations	}	* Of the western section, - -	85,258 00	
and		* Of the feeder and dam at Brookland,	3,500 00	
Embankments,		* Of the eastern section, - -	141,426 00	
			<hr/> 230,184 00	

Masonry,	{ * Of the culverts and aqueducts, -	42,287 00	
	{ Of 244 feet lift of locks at \$ 400 per foot, -	97,600 00	
			139,887 00
1,400 feet lift of inclined planes, with moveable locks, at			
\$ 200 per foot, -	-	-	280,000 00
* 150 Bridges, at \$ 100 each, -	-	-	15,000 00
* 76 miles of grubbing, at \$ 200 per mile, -	-	-	15,200 00
* 76 miles of fence, at \$ 480 per mile, -	-	-	36,480 00
			716,751 00
Engineering and superintendence, say 5 per cent. -	-	-	35,837 55
Contingent expenses, say 10 per cent. -	-	-	71,675 10
Total expense of proposed canal,			<u>\$ 824,263 65</u>

Note.—The items marked thus * are common to both estimates.

Total expense with an entire system of locks,	-	-	-	1,148,103 65
Do with locks and inclined planes,	-	-	-	824,263 65
Difference in favor of Mr. Renwick's plan,				<u>\$ 323,840 00</u>

By comparing this cost of \$ 824,263 65, with the minimum nett revenue of \$ 138,271, (see page 106) we find that an interest will accrue from the whole investment, of $16\frac{77}{100}$ per cent. while that accruing on the supposition of a system of locks, was found to be $12\frac{4}{100}$ per cent., giving a difference of interest in favor of Mr. Renwick's project of $4\frac{73}{100}$ per cent.

We here terminate our report on the projected Morristown canal, having gone into the extended and minute examination, which we thought due to a project so important in its local and general relations.

This examination shows, that the project, under any point of view, is practicable as to cost, and promising as to revenue; but that, in both these respects, there is a decided preference to be given to a system of inclined planes, combined with fixed locks, as proposed by Mr. Renwick. It is greatly to be desired, therefore, that the invention of this gentleman may be sanctioned by experience; because, not only will the execution of the design, as it slowly progresses, enable him to mature and perfect its details, but it is experience alone, which can effectually remove the fears and doubts with which inventions the most useful are at first regarded. To us, however, whether we consider the economy, the utility, or the durability of these inclined planes, all is certain; and we look confidently forward to the day when their introduction will be regarded as a most important era in the history of canal navigation, and especially in this country, to which they are so peculiarly adapted.

We connect with this report, a "map exhibiting the route of the proposed canal, from the tide water of the Passaic river to the Delaware river, with the adjacent country;" a "map showing the relation of the proposed canal with the upper basins of the Delaware and Susquehannah rivers," and a sheet containing a plan, profile, and elevations of Mr. Renwick's inclined plane.

All which is most respectfully submitted,

BERNARD. *Brig. Genl.*

JOS. G. TOTTEN,

Top. Eng. Bt. Lt. Col.

Extracts from the Report of the President to the Directors of the Morris Canal and Banking Company, of the 30th of April, 1827.

“I have just returned from a visit to our canal, on the line of which I have past the last eight days.

“I may congratulate you on the progress of the work, and on the assurance experience affords, that it may be completed in the course of the season of 1828, at an expense not greater than the estimate of our Chief Engineer, presented to you in July, 1826; that is to say, for one million of dollars.”

“The extensive dam and locks of masonry at the Hopatcong lake, have been completed; although it has been predicted by some, who, probably, have not of late heartily wished success to the canal, that the water would not rise or be retained in this reservoir, it has already risen to twelve feet above the bottom of the discharge-gates, although seven water-wheels, to move machinery, are constantly supplied from the dam: it will afford a supply five times greater than would be necessary for all the locks that would be requisite on the whole line.

“Notwithstanding there is such a superabundance of water, it has been determined to adopt inclined planes, rather than locks, to overcome the greatest elevations; because the system of locks and inclined planes may be carried into effect at lesser expense, by between two and three hundred thousand dollars, than if locks only were used; and, because there will be a great saving of time by passing boats over the greatest heights on inclined planes.

“An inclined plane, to surmount an elevation of fifty-two feet, was completed at Rockaway early in the last season. Having again seen it in operation, I am satisfied, that a well-constructed machine, made sufficiently strong and powerful, upon the same principles with this one, would answer the purpose, and be greatly preferable to locks. It passes a boat loaded with stone, computed to weigh fifteen tons, from the lower to the upper level, in twelve minutes, by the mere force of the water power, without that relief which would be afforded if there were, as there will be, when the canal is in operation, a boat to descend and to act, during the greatest part of a transit, as a counterpoise, while one is ascending. By locks, a boat would not ordinarily be passed over the same height in less than fifty minutes.

“It is obvious that the machine at Rockaway is not perfect either as to its mechanism or workmanship. A confidence that an inclined plane on better principles and of better construction might be made, induced the Company, last Fall, to offer a premium for the best model: this brought forward nineteen competitors for the reward. It is probable, that, by a machine constructed after either of the models produced, a boat might be passed over any elevation on our canal. The merits of several of the models appeared so nearly equal, so much like each other in principle, and so similar to what was before well known, that it was difficult to decide which, if any, was entitled to the premium: but it was given to the person claiming to be the inventor of the inclined plane in operation at Rockaway, for an improve-

ment on his plan ; which, however, it is by no means decided to adopt. Since the premium was awarded, further information on this subject has been obtained; other models have been brought forward, and scientific and practical men are engaged to devote their attention to this subject. Two gentlemen, who are soon expected to return from Europe, have been requested to bring with them the information that country now affords.

“ In the mean while, active preparations are making for constructing the planes wherever it is proposed to use them: for as the foundations and a great part of the superstructures will be the same, whatever may be the machinery, materials can be provided and the ground prepared, before any plan be definitely adopted. When this is done, it will require no great time or work to put the materials together.

“ Independent of the experiment we have made, which appears to be conclusive, there seems no reason why there should not be an entire confidence in the planes. If the opinions of men of experience and science can give assurance, there ought to be no doubt. Fulton predicted that inclined planes will, in all situations, supersede locks, and that these will be considered as the infancy of canal navigation. Governor Clinton, whose mind has been so long, and with such glorious success, turned to canals, is decidedly in favor of inclined planes to overcome considerable elevations. The engineers of the United States who surveyed our canal route, under the directions of the General Government, as well as all the persons the Company has employed or consulted, have given decided opinions in favor of inclined planes. If, after all this, there is any doubt, we may refer to what is actually done in Europe, where the use of inclined planes is no novelty.

“ Of the numerous instances of their application, both in Great Britain and in France, it may be sufficient to mention that, on the Shropshire Canal, there is an inclined plane, with a perpendicular rise of two hundred and seven feet; whereas, the greatest height we have to surmount at any one point, is ninety feet, and the average of all the planes is less than sixty-five feet.

“ But, since the Shropshire inclined plane was erected, great improvements have been made in the mechanic arts: we have daily an evidence of this in the operations of the dry-dock railways, which has taken up a vessel of more than five hundred tons. The greatest weight it would be requisite for our inclined planes to sustain, whether the boats be carried up dry, or in immovable water-locks, would be sixty tons ; to move which, over our highest inclined plane, which will have a rise of one foot to eight, will require a force of less than ten tons, and not near so much if the principle of counter-weight be applied.”

“ There is every reason to believe, that the anticipations of revenue from the canal, have not been too sanguine. The Lehigh Company, with augmented means, are pursuing with energy the improvement of the river to the coal mines; their navigation terminates on the Delaware, opposite to the mouth of our canal; the boats, that take coal from the Lehigh mines, will deliver it at the doors of consumers in

the city of New-York: it is not possible that this article can be carried to the city at so little expense by any other canal, or by any other conveyance. The proprietors of the Lehigh coal mines have offered to enter into a contract to deliver annually, for a number of years, at the mouth of our canal, fifty thousand tons of coal, at three dollars a ton. The cost of transportation from thence to New-York will not exceed, including tolls and every other expense, two dollars; so that coal brought through the Morris Canal can be afforded at about one half of what that article has been usually sold for in this city."

"Herewith will be submitted to you the accounts of the Canal Commissioner, and of the Chief Engineer, made up as the by-laws require, to the first instant. By these it will appear that there has been expended for the canal to the last mentioned date, the sum of \$356,875 43 cents; and there is due for work done, \$61,042 58 cents. I also present to you a statement which shows the state of the work on each section of the canal.

"There is also an estimate of the cost of the work done, and of what remains to be done on each section. It appears that of the one hundred and sixty-five sections of forty-two chains, into which the line from the Delaware to Newark is divided, one hundred and twenty have been worked; sixty-seven are entirely completed; and that, on an average, more than $\frac{9}{16}$ of the excavation of the whole line are done. "The dam and locks at Hopatcong Lake, and a stone dam at Saxton's Falls, works of great magnitude, are entirely finished; two-thirds of all the lockage are also completed, and the greatest part of the materials provided and prepared for all the residue: the timber for the aqueducts has been prepared; such preparations are making for the aqueduct at the Little Falls, that it can be completed this season: a statement, also herewith submitted, will show you more particularly the preparations which have been made for, and the progress made in, the construction of the planes, locks, and aqueducts."

Sections.

<p>61 62 63 64 65 66 67 68 69 70 71 72 73 74 75</p>	<p>Nothing done. This is the last seven and one-half miles towards the Delaware. They have not been worked, because the route of the Canal, for this distance, will depend on the point at which it terminates in the Delaware, which has not been definitely settled. There is nothing in this distance but easy earth excavation, which will probably be done for less than eight cents the cubic yard.</p>
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the city of New-York: it is not possible that this article can be carried to the city at so little expense by any other canal, or by any other conveyance. The proprietors of the Lehigh coal mines have offered to enter into a contract to deliver annually, for a number of years, at the mouth of our canal, fifty thousand tons of coal, at three dollars a ton. The cost of transportation from thence to New-York will not exceed, including tolls and every other expense, two dollars; so that coal brought through the Morris Canal can be afforded at about one half of what that article has been usually sold for in this city."

"Herewith will be submitted to you the accounts of the Canal Commissioner, and of the Chief Engineer, made up as the by-laws require, to the first instant. By these it will appear that there has been expended for the canal to the last mentioned date, the sum of \$356,875 43 cents; and there is due for work done, \$61,042 38 cents. I also present to you a statement which shows the state of the work on each section of the canal.

"There is also an estimate of the cost of the work done, and of what remains to be done on each section. It appears that of the one hundred and sixty-five sections of forty-two chains, into which the line from the Delaware to Newark is divided, one hundred and twenty have been worked; sixty-seven are entirely completed; and that, on an average, more than $\frac{9}{16}$ of the excavation of the whole line are done. "The dam and locks at Hopatcong Lake, and a stone dam at Saxton's Falls, works of great magnitude, are entirely finished; two-thirds of all the lockage are also completed, and the greatest part of the materials provided and prepared for all the residue: the timber for the aqueducts has been prepared; such preparations are making for the aqueduct at the Little Falls, that it can be completed this season: a statement, also herewith submitted, will show you more particularly the preparations which have been made for, and the progress made in, the construction of the planes, locks, and aqueducts."

Sections.

<p>61 62 63 64 65 66 67 68 69 70 71 72 73 74 75</p>	<p>Nothing done. This is the last seven and one-half miles towards the Delaware. They have not been worked, because the route of the Canal, for this distance, will depend on the point at which it terminates in the Delaware, which has not been definitely settled. There is nothing in this distance but easy earth excavation, which will probably be done for less than eight cents the cubic yard.</p>
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TABLE, exhibiting the prices of various kinds of work performed in the construction of the different sections of the Morris Canal.

Length and number of each section.	EXCAVATION AND REMOVAL OF MATERIALS, PER CUBIC YARD.										EMBANKMENT.		WALLS OF DRY MASONRY.		MORTARED WALLS OF GAMMERSH MASONRY.			
	Common soil, or loam and sand.	Clay and gravel.	Hard gravel.	Hard pan.	Quick sand.	Loose stone, removable without blasting.	Red friable sand rock blasted in part.	Trap rock in boulders, blasted.	Granite rock in place and in boulders.	Solid trap rock in situ, blasted.	Distance hauled, in feet.	Price per cubic yard.	The perch of 16½ cub. ft. the yard 27 do		Range work in aqueduct.	Arches in culverts.	A general description of the locks, aqueducts, &c. of the canal, & the number of perches of stone in one foot elevation of each lock.	A general description of the canal, its length, breadth, and depth, and general plan.
													Slope walls on Morris canal.	Bridge abutments, perpendicular. Per perch.				
The Morris Canal is divided into two great sections, Eastern and Western. From the summit, the Eastern section to Newark is about 49 miles, and costs	Cts. 8 to 10	12½	14 to 16	25	25	and measuring at least ½ cub. yd. each. 50	50	62½	62½ to \$1	\$1 to \$2	Various distances, from 400 to 800 ft.	10, 12½, 17	per cubic yard, say 50 cents.				Lock of 7 feet lift contains about 864 perches 8 feet lift 954 9 1,060 10 1,175	The canal, when completed, will extend from Easton, Pennsylvania, to the tide waters of the Hudson, which, by its course, is a distance of one hundred miles, its breadth, at surface of water, is 32 feet, with four feet depth of water. The elevation to be overcome, ascending and descending, is a little more than 1,600 feet, most of which will be overcome by inclined planes, which will cost about \$175 per foot lift; and which, from the experiments made, promise the most complete success.
From the summit to Easton, the Western section is about 38 miles, & costs	8 to 10	12½	16	-	-	50	-	-	62½	-	-	10, 12½, 18	-	1 25 1 75	2	\$2 pr. perch		

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“ Dams and Locks.

The great dam, and the locks at the mouth or outlet of the Hopatcung Lake, which are works of great magnitude, are finished.

WESTERN DIVISION.

On section 17 Guard lock finished.
 15 Lift lock do.
 11 Guard lock do.
 7 Lift lock do.
 42 } Lift lock, nothing done.
 62 }

EASTERN DIVISION.

On section 5 Lift lock finished.
 6 do. do.
 12 Stone and timber on the spot.
 16 Lift lock finished.
 17 do. do.
 18 do. do.
 19 Dam and guard lock finished.
 30 Lift lock nearly finished.
 34 do half done, all the materials provided.
 35 } Two lift locks commenced, and most of the materials
 36 } on the spot.
 38 Lift lock, timber and plank for the foundation provided.
 51 Lift lock, materials all on the spot.
 86 Lift lock, stone and a great part of the materials provided.

This is all the lockage on the Canal between the Delaware and the Passaic, of which two-thirds may be considered as done.”

“ Inclined Planes.

“ One of fifty-two lift, is finished at Rockaway. The walls for another of thirty-eight lift, on section No. 5, at Drakesville, are laid. Some of the materials for others are provided, but nothing as to the rest has been done. The grounds are preparing for the inclined plane at Boontown Falls, which is a lift of ninety feet, and is the highest on the Canal. The contractors will engage to do the mason work in three weeks, and it can be completed in six weeks.”

“ Communication from his Excellency Governor Clinton.

“ Governor Clinton has been so good as to visit, with the President of the Company and the Canal Committee, the inclined planes at Rockaway, and to inspect the Eastern Division of the Canal from the summit level to the Hudson, at the city of Jersey.

“The inclined plane was put in operation while he was there, and he, with the Committee and a large number of persons, in all not less than forty, passed on the inclined plane, in a large and heavy scow, loaded with a quantity of stones, from the upper to the lower level, and from thence, back into the upper level. The transit from one level to the other, a difference in height of fifty-two feet, was made in eight minutes.

“The following is an extract from a communication to the President of the Company from Governor Clinton, which expresses his opinion of the inclined plane, his views of the progress of the work, and of the practicability and advantages of the Canal.

• In England and France, inclined planes have been successfully adopted on a limited scale, and there is no reason why they may not be introduced on the Morris Canal, unless it may be that a load of twenty-five tons may render that impracticable which has been found easy for vessels of eight or ten tons. There is nothing in the objection, that can be considered of a formidable nature : but the best demonstration in this, as in all other cases, is actual experiment, and this has been exhibited at Rockaway ; an inclined plane of fifty-two feet has been erected, and a vessel of large dimensions has been tried on it, without any inconvenience and with great rapidity. Having participated in a passage up and down it, I can speak with confidence on the subject. The work may be greatly improved, and in its present state, it affords unequivocal testimony in favor of the utility, the practicability, and the economy of the erection, and completely silences all cavils and objections.

• I was not a little surprised to observe the progress made in the work in general, and I consider it quite easy to accomplish the whole, and to render it operative in July, 1828. The funds have been applied with exemplary economy ; what has been done, has been well done. The prospects of abundant remuneration to the stockholders are very encouraging. The most productive sources of revenue will be furnished by this conveyance ; to wit, coal, iron, lime, copper, zinc, manganese, copperas, plumbago, turpentine, marble, lumber, manures of various kinds, the products of agriculture, and the fabrics of manufactures.

• I should regret exceedingly if this important work should be lost to the public, for the want of three or four hundred thousand dollars. It is manifestly the interest of the stockholders to complete it, and co-operators may confidently calculate upon certain and ample returns for their advances. The estimate of the Engineer has been verified by the prosperous progress of the works, and there is not a shadow of doubt as to the resulting advantages to individuals, and as to the immense benefits to the community.

‘DE WITT CLINTON.

‘NEW YORK, May 19, 1827.’

“*Note.*—It has been suggested, that, if the Morris Canal realizes the expectations of its friends, it would monopolise the supply of Coal for

the New York market, the Eastern States, and the country connected with it. But, if the price of anthracite coal be reduced to what it may be delivered for in the city of New York, and afford a fair profit to the venders, it will become the general fuel, not only for domestic use, but for steamboats, manufactories, &c. And it is very certain, that a sufficient number of boats could not be passed through the Morris Canal to supply one-third the demand. Besides, the freight of coal would be less profitable to the Canal Company, than the freight of the products of agriculture and manufactories. Of these, the country connected with the Morris Canal, will afford such quantities, that a large portion of the boats on the Canal will be employed in the transportation of these articles, to the exclusion of coal."

NEWARK, 15th March, 1828.

DEAR SIR : The enclosed table from Gen. Mercer, was forwarded to me by the Hon. C. D. Colden, some time since, and would have received my earlier attention had I not been absent, and detained on business of importance. Aware that it is late in the session, and of the delay already accrued, I forward it with less descriptive explanation than I should have done with more leisure.

Any reports on internal improvements, or other interesting matter, would be gratefully received by your obedient servant,

W. W. BEACH.

Hon. LEWIS CONDICT.



Farther extracts from the reports of the Canal Commissioners to the Legislature of Pennsylvania.

CANAL OFFICE, Meadville, November 16, 1827.

To the Board of Canal Commissioners.

GENTLEMEN : In compliance with the instructions of the Board, the Superintendent begs leave to make the following report : That, he put under contract the entire division, and French creek feeder, for the Pennsylvania canal, directed by law. The letting took place on the 15th day of August, last, and duplicate contracts were executed as speedily as possible thereafter. One of each contract, now transmitted, to be deposited in the State Treasurer's office, and the other delivered to the party entitled thereto, and a transcript retained for the use of the Commissioner.

The contractors were bound to commence working on the several sections of the canal, within thirty days from the said 15th of August, which was strictly attended to, and prosecuted with energy and advantage, according to the number of laborers engaged, and could be obtained at the time. All the sections on the line are grubbed and cleared, with the exception of one which was abandoned and re-let. Some of the sections are nearly finished, and others in great forwardness. The length of the line under contract is about nine miles, and laid off in sections, averaging about eighty perches each.

The names of the contractors, together with the amount contracted for, you will find represented in a tabular form, marked (A) From the estimate of James Ferguson, Esq. engineer, marked (B) the total amount of labor to be performed in the formation of said canal will be found.

The first estimate made by the said engineer of the amount of work actually done by the said contractors, aforesaid, on the several and respective sections of the French creek feeder, and the amount actually expended and paid thereon, reserving the one-fifth part, as required by law, is fully set forth in the schedule marked (C) together with a tabular form thereto annexed.

The building of the several culverts fixed on by the engineer on sections 4, 5, 8, 9, 10, 12, 13, 18, 21, 27, and 33, have been contracted for, which are to be built of stone, at the following rates :—For the foundation wall, from \$ 1 50 to \$ 1 75 per perch of 25 cubic feet, for the parapet wall, from \$2 25 to \$2 50 per perch, and for the arch, from \$ 3 to \$ 3 50, per perch. And for which large quantities of stone is furnished.

A contract has been made with Henry Bole, George W. King, and Henry Hurst, for making a road south and immediately below Meadville, to supply that part of the turnpike road occupied by the canal, at \$ 740 per mile ; the distance one mile and one-fourth. Also, a contract with Levi L. Morris, of Meadville, to remove his joiner's shop which stood on the line of canal, and agreed to pay him the sum of \$ 28. Also a contract with John Crosby to remove a log barn,

standing on the line of canal for the sum of \$ 5, and also, a contract with Artemas Smith, to remove his fence included in the line of canal, and to pay him the sum of \$ 3 therefor.

The road and farm bridges will be put under contract in a short time, to give contractors an opportunity to procure materials this Winter. The whole of the work contracted for is to be completed before the 1st day of August, 1828. The number of hands employed on the canal in October, were about 700. Since that time a less number are engaged, in consequence of wet weather.

The contracts are, generally, below the price or estimate fixed by the engineer. The following deviations will appear.—The grubbing on section No 23, was contracted for at the estimate of the engineer, and upon his re-estimate, the allowance reduced ; which contract I am not at liberty to alter. On section 32, the 50 cents for stone not found on the ground, was agreed to, in consequence of the great distance and difficulty to procure the same. On section 33, the bidder was the owner of the land, (and owners were generally preferred) and being a good contractor, the allowance of twelve and one half cents was given for excavation, the estimate being eleven cents.

A list of engineers, &c. required, will be put off for some time, in consequence of the absence of the engineer, and the want of a full report from him.

The report obtained from the engineer, upon the work under his charge, together with an estimate of its cost based upon the actual contract prices, is also forwarded.

Respectfully submitted.

JOHN PHILLIPS,

Superintendent French creek Feeder.

(B.)

Estimate of the quantity of work done on the several sections of the French Creek Feeder, as reported by J. Ferguson, engineer, together with the payments made thereon.

1. James Brawley, Grubbing, \$250. $\frac{7}{8}$ done		
\$218 75, dist. $\frac{1}{5}$,	\$175 00	
Excavation 1377 c. yds. $8\frac{1}{2}$		
cents, $\frac{1}{5}$,	93 64	
Solid rock 265 c. yds. 37		
cents, dist. $\frac{1}{5}$,	78 44	
	<hr/>	\$347 08
2. Henry Colt, Grubbing, \$220, $\frac{5}{6}$ done \$183 34,		
dist. $\frac{1}{5}$,	146 68	
Excavation 451 c. yds. 7 cts. dist. $\frac{1}{5}$,	25 25	
Solid rock 72 c. yds. $37\frac{1}{2}$ cts. dist. $\frac{1}{5}$,	21 32	
Slope wall 123 per. $\frac{35}{100}$ \$1 50, dist. $\frac{1}{5}$,	148 20	
Drain, \$12, dist. $\frac{1}{5}$	9 60	
	<hr/>	351 05
3. Alexander Shaw, Grubbing \$100, dist. $\frac{1}{5}$,	80 00	
Excavation 1504.4 c. yds. 8 cts.		
dist. $\frac{1}{5}$,	96 28	
Embankment, 153 c. yds. 11 cts. $\frac{1}{5}$	13 47	
	<hr/>	189 75
4. Albert E. Bull, Grubbing \$120, $\frac{4}{5}$ done \$96,		
dist. $\frac{1}{5}$,	76 80	
	<hr/>	76 80
5. Arthur Collum, James Dickson, and Warren Payson, Grubbing \$150, dist. $\frac{1}{5}$,	120 00	
	<hr/>	120 00
6. John Masters, Grubbing \$75, $\frac{5}{6}$ done, \$62 50,		
dist. $\frac{1}{5}$,	50 00	
Excavation 1169 c. yds. 9 cts. dist. $\frac{1}{5}$	84 17	
	<hr/>	134 17
7. Ira Avery and Alexander M'Claskey,		
Grubbing \$120, dist. $\frac{1}{5}$	96 00	
Excavation 2273 c. yds. 7 cts. dist. $\frac{1}{5}$	127 28	
Embankment 345 c. yds. 10 cts. dist. $\frac{1}{5}$	27 60	
	<hr/>	250 88
8. Arthur Cullum, Grubbing \$210, $\frac{6}{8}$ done \$167 50		
dist. $\frac{1}{5}$,	126 00	
Excavation 596 c. yds. 91 cts.		
dist. $\frac{1}{5}$,	52 45	
	<hr/>	178 45
9. Samuel Harroon, Grubbing \$144, $\frac{3}{5}$ done \$128,		
dis. $\frac{1}{5}$	\$102 40	
Excavation 529 c. yds. 9 cts.		
dist. $\frac{1}{5}$,	38 09	
	<hr/>	140 49

10. Elliott Harroon, Grubbing \$105, dist. $\frac{1}{3}$	\$84 00	
Excavation 1030 yds. 8 cts.		
dist. $\frac{1}{3}$,	65 92	
	<hr/>	\$149 92
11. Henry Hurst, Grubbing \$120, $\frac{3}{4}$ done \$90,		
dist. $\frac{1}{3}$,	72 00	
	<hr/>	72 00
12. Albert E. Bull, Grubbing \$190, $\frac{3}{10}$ done		
\$152, dist. $\frac{1}{3}$,	121 60	
Excavation 1266 c. yds. 8 cts.		
dist. $\frac{1}{3}$,	81 02	
	<hr/>	202 62
13. Albert E. Bull, Grubbing \$95, $\frac{4}{5}$ done \$75,		
dist. $\frac{1}{3}$,	60 80	
Excavation 962 c. yds. 8 cts.		
dist. $\frac{1}{3}$,	61 57	
	<hr/>	122 37
14. Daniel Smith, Grubbing \$110, $\frac{5}{7}$ done \$78		
58, dist. $\frac{1}{3}$,	62 86	
Excavation 504 c. yds. 10 cts.		
dist. $\frac{1}{3}$,	40 32	
	<hr/>	103 18
15. David Compton, Grubbing, \$60, dist. $\frac{1}{3}$,	48 00	
Excavation 664.2 yds. 9 cts. dis. $\frac{1}{3}$	47 82	
	<hr/>	95 82
16. Alexander M'Claskey and Alva Barr,		
Grubbing \$25, half done \$12 50, dist. $\frac{1}{3}$,	10 00	
	<hr/>	245 89
17. Levi Cox, Grubbing \$100, dist. $\frac{1}{3}$,	80 00	
Excavation 2304 c. yds. 9 cts. dist. $\frac{1}{3}$,	165 39	
	<hr/>	245 39
18. John J. Lyons, Grubbing \$150, dist. $\frac{1}{3}$,	120 00	
Excavation 2720 c. yds. $6\frac{1}{4}$		
cts. dist. $\frac{1}{3}$,	136 00	
Embankment 410 c. yds. $7\frac{1}{2}$		
cts. dist. $\frac{1}{3}$,	24 60	
Extra labor, \$70, dist. $\frac{1}{3}$,	56 00	
	<hr/>	336 60
19. Alexander M'Claskey and Alva Barr,		
Grubbing \$160, $\frac{1}{10}$ done \$16, dist. $\frac{1}{3}$	12 80	
	<hr/>	12 80
20. John Raddle, Grubbing \$90, dist. $\frac{1}{3}$	72 00	
Excavation 4414 c. yds. 7 cts.		
dist. $\frac{1}{3}$,	247 18	
Solid rock, 20 yds. $56\frac{1}{4}$ cts. dist. $\frac{1}{3}$,	9 00	
Allowance for removing timber		
\$115, dist. $\frac{1}{3}$,	92 00	
	<hr/>	420 18
21. Arthur Cullum, Jas. Dickson and Warren		
Payson, Grubbing \$50, dist. $\frac{1}{3}$,	40 00	

125

382 29

48 00

285 51

181 92

245 40

335 24

185 98

228 88

108 80

144 77

39 31

10. Elliott Harroon, Grubbing \$105, dist. $\frac{1}{3}$	\$84 00	
Excavation 1030 yds. 8 cts.		
dist. $\frac{1}{3}$,	65 92	
	<hr/>	\$149 92
11. Henry Hurst, Grubbing \$120, $\frac{3}{4}$ done \$90,		
dist. $\frac{1}{3}$,	72 00	
	<hr/>	72 00
12. Albert E. Bull, Grubbing \$190, $\frac{8}{10}$ done		
\$152, dist. $\frac{1}{3}$,	121 60	
Excavation 1266 c. yds. 8 cts.		
dist. $\frac{1}{3}$,	81 02	
	<hr/>	202 62
13. Albert E. Bull, Grubbing \$95, $\frac{4}{5}$ done \$75,		
dist. $\frac{1}{3}$,	60 80	
Excavation 962 c. yds. 8 cts.		
dist. $\frac{1}{3}$,	61 57	
	<hr/>	122 37
14. Daniel Smith, Grubbing \$110, $\frac{5}{7}$ done \$78		
58, dist. $\frac{1}{3}$,	62 86	
Excavation 504 c. yds. 10 cts.		
dist. $\frac{1}{3}$,	40 32	
	<hr/>	103 18
15. David Compton, Grubbing, \$60, dist. $\frac{1}{3}$,	48 00	
Excavation 664.2 yds. 9 cts. dis. $\frac{1}{5}$	47 82	
	<hr/>	95 82
16. Alexander M'Claskey and Alva Barr,		
Grubbing \$25, half done \$12 50, dist. $\frac{1}{3}$,	10 00	
	<hr/>	245 89
17. Levi Cox, Grubbing \$100, dist. $\frac{1}{3}$,	80 00	
Excavation 2304 c. yds. 9 cts. dist. $\frac{1}{3}$,	165 39	
	<hr/>	245 39
18. John J. Lyons, Grubbing \$150, dist. $\frac{1}{3}$,	120 00	
Excavation 2720 c. yds. $6\frac{1}{4}$		
cts. dist. $\frac{1}{3}$,	136 00	
Embankment 410 c. yds. $7\frac{1}{2}$		
cts. dist. $\frac{1}{3}$,	24 60	
Extra labor, \$70, dist. $\frac{1}{3}$,	56 00	
	<hr/>	336 60
19. Alexander M'Claskey and Alva Barr,		
Grubbing \$160, $\frac{1}{10}$ done \$16, dist. $\frac{1}{3}$	12 80	
	<hr/>	12 80
20. John Raddle, Grubbing \$90, dist. $\frac{1}{3}$	72 00	
Excavation 4414 c. yds. 7 cts.		
dist. $\frac{1}{3}$,	247 18	
Solid rock, 20 yds. $56\frac{1}{4}$ cts. dist. $\frac{1}{3}$,	9 00	
Allowance for removing timber		
\$115, dist. $\frac{1}{3}$,	92 00	
	<hr/>	420 18
21. Arthur Cullum, Jas. Dickson and Warren		
Payson, Grubbing \$50, dist. $\frac{1}{3}$,	40 00	

REPORT OF JOHN PHILLIPS, Superintendent upon the line of the French Creek feeder, Pennsylvania canal, to the Board of Canal Commissioners.

GENTLEMEN: The Superintendent, in compliance with a resolution of the Board, has the honor to state, that, after notice had been given, he put under contract so much of the French creek feeder as was contemplated in said resolution, divided into thirty-five sections—being a distance of about nine miles, as appears in the following table:

No. of sections.	Names of Contractors.	Date of Contracts.	EXCAVATION PER CUBIC YD.						Pudding per cubic yard.	Wall per perch on outside of Canal.	Grubbing.
			Common.	Rock.	Slate.	Hardpan.	Embankment.	Per cubic yard.			
			Centis.	Centis.	Centis.	Centis.	Centis.	Est. Eng.	Centis.	Centis.	
1	James Brawley,	August 20, 1827,	84	37	15	15	15	5		2250 for section.	
2	Henry Colt,	" 22,	7	37	18	15				220	
3	Alexander Brawley,	" 22,	8		28	18				100	
4	Alfred Ball,	" 22,	8		25	15				190	
5	Arthur Collins, James Dickson, and Warren Payson,	" 21,	74	34	14	13	9	5		150	
6	John Masters,	" 20,	9		20	17	10			75	
7	Ira Avery and Alexander McCloskey,	" 28,	7	38	20	20	10			120	
8	Arthur Collum,	" 21,	11	39	20	14	13			210	
9	Samuel Harroun,	" 22,	9	37	27	17	10			144	
10	Silvest Harroun,	" 21,	8	37	26	17	10			105	
11	Henry Ball,	November, 14,	8	10	25	25	134			130	
12	Albert E. Ball,	" 14,	8		27	14	10			160	
13	Albert E. Ball,	" 21,	8		27	14	10			160	
14	Daniel Smith,	" 21,	8		28	16	11			110	
15	David Compton,	Septem. 9,	10	45	28	17	10			60	
16	Alva Barr and Alexander McCloskey,	August 28,	7	38	18	14	10			25	
17	Levi Cox,	" 28,	9	374	27	16	10			100	
18	John J. Lyons,	" 28,	64	364	184	9	74	11		80	
19	Alva Barr, Alexander McCloskey and Alva Barr,	" 28,	8	38	20	25	10			160	
20	John Barr,	" 25,	7	364	25	18	8	12	1 15	90	
21	Arthur Collum, James Dickson, and Warren Payson,	" 21,	9	51	14	9		5		50	
22	William Dickson and James Dickson, jun.,	" 20,	9	45	12	18				60	
23	Henry Malloy, Silas Harris, Jonathan Spalding, R. W. Sherman, John S. Sherman, and Stephen B. Martindale,	" 22,	8	48	25	12	10	18	Estimate Engineer	70	
24	S. C. company,	" 22,	8	48	12	12	10			55	
25	George Buckley, John Barclay, and Wm. Latta,	" 20,	64	35	12	9	10			50	
26	George Hurst and Henry Hurst,	Septem. 5,	7	30	124	12	10			30	
27	Arthur Collum, James Dickson, and Warren Payson,	" 21,	8	25	13	14	9	5		7	
28	Albert E. Ball,	August 21,	9	22	15	10					
29	John Shattuck, William Megan, and Albert Thomas King,	" 20,	8	28	19	10				30	
30	Thomas King,	Septem. 20,	8	50	25	15	9			40	
31	Conner Barclay, John Barclay, and William Latta,	August 21,	8	50	25	15	9				
32	Thomas King	" 21,	7	374	124	12	6	15		1 50	81 75 wall per perch on inner side of canal, and 50 c. for every p. in wall not found on the ground. 8130 grubbing for sect.
33	Robert Mead,	" 21,	8	50	25	15	9				
34	Hugh Brawley and Hugh McDill,	" 30,	124	75	20	184	184	8		1 75	8180 for section
35	Alexander McCloskey and Alva Barr,	" 28,	10	50	14	14	13	12		1 00	190
			7	55	50	15	8	12			160

Respectfully submitted,

JOHN PHILLIPS, S. I. C. E. Pa. Canal.

124

10. E

11. H

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14. D

15. D

16. A
C

17. L

18. J

19. A
C

20. J

21. Arthur Cuny, Jas. Dickson and Watson
Payson, Grubbing \$50, dist. $\frac{1}{3}$,

40 00

Excavation 4123 c. yds. 9 cts. dist. $\frac{1}{3}$,	296 85	
Allowance, extra, \$46, dist. $\frac{1}{3}$.	36 80	
Embankment 120 c. yds. 9 cts. dist. $\frac{1}{3}$,	8 64	
	<hr/>	382 29
22. William Dickson and James Dickson, Jr. Grubbing \$60, dist. $\frac{1}{3}$,	48 00	
	<hr/>	48 00
23. Henry Mallory, Silas Harris, Jonathan Spalding, Richard W. Sherman, John J. Sherman, and Stephen B. Martindale, Grubbing \$70, dist. $\frac{1}{3}$,	56 00	
Excavation 3586 c. yds. 8 cts. dist. $\frac{1}{3}$,	229 51	
	<hr/>	285 51
24. Same company, Grubbing \$55, dist. $\frac{1}{3}$,	44 00	
Excavation 2149 2 c. yds. 8 cts. dist. $\frac{1}{3}$,	137 54	
Solid rock 48 cts. 1 c. yd. dist. $\frac{1}{3}$	38	
	<hr/>	181 92
25. Cooper Barkley, Jno. Bartley and Wm. Latta, Grubbing \$50, dist. 1-5,	40 00	
Excavation 2149.2 c. yds. 8 cts. dist. $\frac{1}{3}$,	186 20	
Embankment 90 c. yds. 10 cts. dist. $\frac{1}{3}$,	7 20	
\$15 for removing stumps, dist. $\frac{1}{3}$,	12 00	
	<hr/>	245 40
26. George Hurst and Henry Hurst, Grubbing \$30, dist. $\frac{1}{3}$,	24 00	
Excavation 4449.7 c. yds. 7 cts. dist. $\frac{1}{3}$,	249 16	
Embankment 776 c. yds. 10 cts. dist. $\frac{1}{3}$,	62 08	
	<hr/>	335 24
27. Arthur Cullum, Jas. Dickson and Warren Payson, Excavation 156 c. yds. 8 cts. dist. $\frac{1}{3}$,	9 98	
Extra labor \$220, dist. $\frac{1}{3}$,	176 00	
	<hr/>	185 98
28. Albert E. Bull, Grubbing \$7, dist. $\frac{1}{3}$	5 60	
Excavation 2,990 c. yds. 9 cts. dist. $\frac{1}{3}$,	215 28	
Bog ore 19 yds. solid rock, one yd. 50 cts. dist. $\frac{1}{3}$,	8 00	
	<hr/>	228 88
29. Jared Shattuck, Wm. Magaw and Albert E. Bull, Grubbing \$30, dist. $\frac{1}{3}$,	24 00	
106 perch of stone quarried, at \$1, dist. $\frac{1}{3}$,	84 80	
	<hr/>	108 80
30. Thomas King, Grubbing \$40, dist. $\frac{1}{3}$,	32 00	
Excavation 1762 c. yds. 8 cts. dist. $\frac{1}{3}$,	112 77	
	<hr/>	144 77
31. Cooper Barclay, Jno. Bartley and Wm. Latta, Grubbing \$90. $\frac{1}{2}$ done \$45, dist. $\frac{1}{3}$,	36 00	
Excavation 59.2 c. yds. 7 cts. dist. $\frac{1}{3}$,	3 31	
	<hr/>	39 31

32. Thomas King. Grubbing \$130, dist. $\frac{1}{3}$,	\$ 104 00	
Excavation 626 c. yds. 8 cts. dist. $\frac{1}{3}$,	40 06	
Slope wall 225 perches, \$1 50 per		
perch and an addition of 50 per cent		
as per agreement, \$4 50, dist. $\frac{1}{3}$	360 00	
154 per. stone quarried at \$1 per perch,		
dist. $\frac{1}{3}$,	123 20	
	<hr/>	\$ 627 26
33. Robert Mead, Grubbing \$180. $\frac{9}{10}$ done \$162,		
dist. $\frac{1}{3}$,	129 60	
Excavation 2940.7 c. yds. 12 $\frac{1}{2}$		
cts. dist. $\frac{1}{3}$,	294 07	
Solid rock 8.3 c. yds. 75 cts.		
dist. $\frac{1}{3}$,	4 98	
\$25 for moving logs, dist. $\frac{1}{3}$,	20 00	
	<hr/>	448 65
34. Hugh Brawley and Hugh M'Dill,		
Grubbing \$190, dist. $\frac{1}{3}$,	152 00	
Excavation 996.8 c. yds. 10 cts. dist. $\frac{1}{3}$,	79 71	
Solid rock 66.7 50 cts. dist. $\frac{1}{3}$,	26 68	
	<hr/>	258 39
35. Alexander M'Claskey and Alva Barr,		
Grubbing \$1 30, dist. $\frac{1}{3}$,	104 00	
	<hr/>	104 00

RECAPITULATION.

Sect. 1	\$347 08	19	\$12 80
2	351 05	20	420 18
3	189 75	21	382 29
4	76 80	22	48 00
5	120 00	23	285 51
6	134 17	24	181 92
7	250 88	25	245 40
8	178 45	26	335 24
9	140 49	27	185 98
10	149 92	28	228 88
11	72 00	29	108 80
12	202 62	30	144 77
13	122 37	31	39 31
14	103 18	32	627 26
15	95 82	33	448 65
16	10 00	34	258 39
17	245 89	35	104 00
18	336 60		
		Total	<hr/> \$7,184 45

(C.)

SEC.	DATE.	CONTRACTORS.	Prop. grubbed.	Yards excavated.	Yards embank.	Yards solid rock.	Perch slope wall.	Perch stone quarried.	EXTRA.
No. 1	26	James Brawly	$\frac{7}{16}$	1377	-	265			
2	25	Henry Colt	$\frac{5}{16}$	451	-	72	123.5	-	Drain under bank estimated at \$12.
3	25	Alexander Shaw	$\frac{6}{16}$	154.4	153				
4	27	Albert E. Bull	grubbed						
5	27	Arthur Collum & Co.	$\frac{4}{5}$						
6	25	John Masters	grubbed	1169	345				
7	25	Avery and M'Claskey	$\frac{5}{16}$	2273					
8	25	Arthur Cullum	grubbed	596					
9	25	Samuel Harroon	$\frac{6}{16}$	529	-	-	-	-	A few stumps yet re- maining on this sec- tion.
10	25	Elliott Harroon	$\frac{2}{3}$	1030					
11	25	Henry Hurst	$\frac{3}{8}$	1266					
12	21	Albert E. Bull	$\frac{10}{16}$	962					
13	21	Albert E. Bull	$\frac{4}{16}$	504					
14	21	Daniel Smith,	$\frac{5}{16}$	664.2					
15	21	David Compton	grubbed						
16	27	M'Claskey and Barr	$\frac{1}{2}$	2304	-	-	-	-	Extra labor done \$70.
17	19	Levi Cox	grubbed	2720	410				
18	19	John J. Lyons	grubbed		-				
19	27	M'Claskey and Barr	$\frac{1}{16}$	-	-	20	-	-	\$115 allow. for re- mov. logs fm. road.
20	27	John Readle	grubbed	4414	-				

C.—Continued.

SEC.	DATE.	CONTRACTORS.	Prop. grubbed.	Yards excavated.	Yards embank.	Yards solid rock.	Perch slope wall.	Perch stone quarried.	EXTRA.
No. 21	27	Arthur Collum & Co.	grubbed	4123	120	-	-	-	\$46 allowance.
22	27	William & James Dickson	grubbed	3586.2	-	-	-	-	{ \$15 allowance for moving stumps clay pit.
23	16	J. Spaulding & Co.	grubbed	2749.2	-	1	-	-	
24	16	do.	grubbed	3724	90	-	-	-	
25	27	Cooper Barkley & Co.	grubbed	4449.7	776	-	-	-	{ \$70 allowance for removing wharf at M'Gaw's mill and \$150 for 300 perch of rubble.
26	16	George and Henry Hurst	grubbed	156	-	-	-	-	
27	27	Arthur Collum & Co.	-	2990	-	-	-	-	
28	16	Albert E. Bull	grubbed	-	-	-	-	106 \$1	{ Bogore 19 yds. so- lid rock 1 yd. 50 cts.
29	27	Jared Shattuck & Co.	grubbed	1762	-	-	-	-	
30	27	Thomas King	grubbed	592	-	-	-	-	
31	27	Cooper Barkley & Co.	$\frac{1}{2}$	626	-	-	225	154 \$1	{ \$25 allowance for removing logs from road.
32	27	Thomas King,	grubbed	2940.7	-	8.3	-	-	
33	27	Robert Mead,	$\frac{1}{10}$	996.8	-	66.7	-	-	
34	27	Browley & M'Dill	grubbed	-	-	-	-	-	
35	26	M'Claskey & Barr	grubbed	-	-	-	-	-	

Amounts of cost.		Payments made thereon.	
Sect.		Sect.	
1	\$433 85	1	\$347 08
2	438 81	2	351 05
3	237 18	3	189 75
4	96 00	4	76 80
5	150 00	5	120 00
6	167 71	6	134 17
7	313 60	7	250 88
8	223 6	8	178 45
9	175 61	9	140 49
10	187 40	10	149 92
11	90 00	11	71 00
12	253 27	12	202 62
13	152 96	13	122 37
14	128 97	14	103 18
15	119 77	15	95 82
16	12 50	16	10 00
17	307 36	17	235 89
18	420 75	18	336 60
19	16 00	19	12 80
20	525 22	20	420 18
21	477 86	21	382 29
22	60 00	22	48 00
23	356 88	23	285 51
24	227 40	24	181 92
25	306 75	25	245 40
26	419 05	26	335 24
27	232 47	27	185 98
28	286 10	28	228 88
29	136 00	29	108 80
30	180 94	30	144 77
31	49 13	31	39 31
32	784 7	32	627 26
33	560 81	33	448 65
34	322 98	34	258 39
35	130 00	35	104 00
<hr/>		<hr/>	
\$8,980 56½		\$7,184 45	

Respectfully submitted, &c.

JOHN PHILLIPS,
Superintendent French Creek Feeder, Pa. Canal.

To the Honorable David Scott, President of the Board of Canal Commissioners of the State of Pennsylvania.

SIR: In obedience to instructions from the Commissioners, received through their Secretary, I have prepared in detail an estimate of the probable expense of constructing that part of the French creek feeder, now under contract at the contract prices.

An estimate, similar to the one now submitted, was presented to the Superintendent previous to the time of letting out the work. The only difference between the one and the other, being that, in *this*, the quantities of excavation and embankment are more accurately set down, and the prices for each are now the price of the contract, instead of the estimate of the engineer. The number and dimensions of the culverts are also now definitely settled, and the sites and structure of the bridges concluded on. The other duties assigned to the engineer on this section, have left no time for completing drawings, other than those necessary to be exhibited to the contractors. Plans, &c. for the use of the Commissioners, will be prepared at as early a date as possible.

It will be observed that in locating the line of the feeder, the engineer was restricted in his choice of ground, to such as would preserve a level, corresponding to the height to which it had been determined to raise the Conneaut lake. And, in consequence of this condition, the site of the feeder could not be so favorably located as in ordinary cases, where, by changing the level, a line can be followed more in accordance with the peculiar formation of the country. The compliance with this limitation in the present instance, has placed the feeder on rather unfavorable ground. Its site for nearly the whole distance from Bemis' dam, to the place of the aqueduct, being on the face of a steep bank, which stands at an angle from 30 to 48 degrees with the horizontal plane, and extends at this inclination about thirty feet above the bottom of the feeder, and from 5 to 15 feet below it. Three-fifths of the whole distance is of this character, and, where not exactly of the description above given, it varies only in the depth of the low grounds lying at the foot of the bank; the bank itself preserving nearly a constant elevation, below which the tributary torrents of French creek have, in mingling their alluvions with that of the larger stream, formed an irregular and undulating surface. This bank is so prominent a feature in the topography of the region, that the oldest roads of the country were placed upon its face, or at its base. In consequence of which, for three miles out of nine, the difficulties arising from the nature of the soil have been augmented, from the necessity of removing from the beds of those roads (which are immediately under the base of the feeder bank) large quantities of timber and brush. Another consequence of this location, and which increases its expense considerably, is the frequent use of culverts. The streams are mostly small, but so impetuous as to make it very unadvisable to receive them into the feeder; and, in many instances, crossing so much below its level as to render this disposition of them impossible. But, in addition to the number of culverts necessary on the line, there is the further consideration that this construction must be peculiarly expensive. The ordinary timber foundation would scarcely be safe, and certainly not advisable, in streams, the beds of which are perfectly dry for the greater part of the season; at the same time that the quantity of the bank, above each of them, would render a breach in the canal, at such a point, peculiarly difficult to

repair. The culverts have therefore been contracted to be built with stone foundations, terminating in an inverted arch, and having their water way lined with brick.

There is a single instance also where the peculiar nature of the bank, from which the streams have their origin, has occasioned a difficulty of another kind. The amphitheatre in which the village of Meadville stands, has been formed by the united deposits of French creek and Mill run; the smaller and more rapid streams, bringing down its heavier burthen of loose rock and pebbles which has been covered over and consolidated by the finer deposits of the larger one. For this cause, the plain at the base of the bank, near Meadville, is higher than at any other point, and the Mill run, which, at its greatest floods, discharges 304.6 cubic feet per second, crosses the line of the feeder above the level of the bottom, rendering the construction of a culvert of sufficient dimensions to avoid its greatest discharge, very difficult and expensive; while, at the same time, the expedient of taking it into the feeder would scarce be resorted to, unless indeed there were no other course possible. To avoid this, it was deemed better to change the direction of the run some distance higher up, and by making a cut of about 60 perches in length, to divert the waters of this unmanageable stream, to a place where the feeder is located on the steep bank of the creek, and a culvert of the necessary size can be more easily constructed. This place is near a mill owned by W. A. V. Magane, which derives its supply of water from the Mill run. And an additional inducement to make this disposition of the run, was, that the proprietor of the mill having also the right to the use of the water in the run, might, at any time, divert the whole of it in the direction of the mill, which would render the construction adopted now, in the first instance, a matter indispensable, unless indeed the State were to purchase from the owners of the mill their right to the use of the water.

The peculiar formation of the country on which the feeder is located, will also increase the difficulty and expense of landing up the bridges. The contents of some of the bridge embankments amounting to 1000 cubic yards.

In relation to the probable expense of completing the portion of the feeder now under contract, I am decidedly of opinion, that, except in a single instance (I mean on section 8,) the prices of *excavation* in the original estimate, submitted on the 15th August (a copy of which will be transmitted by the superintendent) were rather too low than too high. And as it cannot be conceived that the contractors intend to lose to a very great amount in the service of the State, and yet have to all appearance offered to do the work for a third less than its absolute value, the inference seems unavoidable that the contracts will be abandoned.

This anomaly however, will disappear, when the Commissioners are made aware of the expectations of the contractors. They, it seems, understood that the contract prices for excavation and embankment were to be applicable only to the lightest and most easily excavated earths, (a sort of substance not often found in public works)

and not such substances as the sections were known to consist of previous to the time of contract ; and that where the ground was uncommonly tenacious, though its precise quality was as well known previously as at present, the engineer was, by allowing one-third rock, or one-fourth hard-pan, to sanction additional expenditure to any amount—rendering the contract of no use or validity at all, except as it empowered him to make any allowance he should think proper.

This being the understanding, it will be seen from the schedule of contract prices, that though the prices of ordinary excavation (the advance guard of the contractor) are in every instance put at the most reasonable rate, still there is a formidable covering party in the rock and hard-pan, by which it seems he supposed the prices were to be regulated. The rock has been allowed, where it was absolutely found. The hard-pan has not been allowed at all. With regard to the latter substance, had it been encountered unexpectedly, it is my opinion that it should have been allowed, even though it be so ill defined a material as to admit of no certain description. But on the French creek feeder, though the ground be indeed terribly hard in some instances, it was nevertheless known to be so ; and in all cases where the character of the ground has been previously determined, the proposition for *ordinary* excavation should, if it mean any thing, mean the price for which the earth, of which this section is known to consist, can be removed. Some of the sections may perhaps be executed for the prices of the contract. These I think are No. 4, 7, 8, 9, 10, 14, 26, 27, 29, and 33.

In the annexed estimate, the prices of excavation, and for the culverts, are the prices of the contract and the quantity of rock judged of from demonstration already made of the nature of the soil.

Respectfully submitted,

J. FERGUSON, *Engineer.*

Meadville, Nov. 18, 1827.

BRISTOL, Nov. 5, 1827.

To the Canal Commissioners of Pennsylvania.

The Superintendent of the Delaware division of the Pennsylvania canal, respectfully submits the following report, viz.

That, in pursuance of the directions of the Board, by authority of the 6th and 7th sections of an act passed the 9th day of April last, entitled "An act to provide for the further extension of the Pennsylvania canal," a party was organized under the direction of Henry G. Sargeant, Esq. engineer, for the purpose of a making a survey and examination along the valley of the Delaware. See statement hereunto annexed, marked A. That survey and examination was commenced on the 9th of July last, and prosecuted with the utmost diligence till completed. A report and estimate thereon having been

made and accepted, and the location of part of the line, to wit : Eighteen miles thereof, beginning at Bristol and extending upwards, along the valley of the Delaware, directed. A party was organized for that purpose, and commenced their operation on the 13th of September last. See statement hereunto annexed, marked B.

Another party was then organized under the direction of Mr. Sargent, and on the 17th of September last, commenced an examination along the valley of the Delaware, from Carpenter's point to Easton. See statement hereunto annexed, marked C.

The Superintendent further reports, that, after having given thirty days' notice in two newspapers printed in the city of Philadelphia, two in Easton, and two in Doylestown, thirty-five sections of the eighteen miles directed to be located as aforesaid, (the same having been divided into thirty-six sections of half a mile each,) were put under contract on the 13th of October last. See statement hereunto annexed, marked D, exhibiting the names of the contractors and the prices at which each section is contracted for. Many of the contractors have already commenced work : the remainder are about to commence : and it is confidently expected, that the excavation on the whole of the sections let, will be in a good state of forwardness this Fall.

Statement marked E, exhibits the estimate for the said eighteen miles, as made by Henry G. Sergeant, Esq. the engineer on the line ; annexed to which are some observations explanatory of any difference that may exist between the estimate and the contract prices.

All which is respectfully submitted.

THOMAS G. KENNEDY,

Superintendent.

(A.)

The survey along the valley of the Delaware from Easton to Bristol, and continued thence to Philadelphia, was commenced on the 9th day of July, 1827, and run, on account of accuracy and despatch, with two levels. The following party having been organized for that purpose, viz.

Henry G. Sargent, engineer, salary \$2.000 per annum.

T. G. Kennedy, assistant engineer and draftsman, \$60 per month.

William Willer, } Assistant do. do. do.

James Sargent, }

Thomas Stewart, jr. }

James M'Keen, } Target-bearers \$1 50 per day.

Charles Carey, }

Daniel D. Rogers, }

Michael S. Heany, } Chain carriers \$1 per day.

Charles Heckman, }

Ralph Harris, axeman, - do. do.

Thomas Arnold, do. pro tem. - do. do.

Robert Ewill, cook, - do. do.

A wagon and one horse, for the transportation of baggage, was sometimes employed ; a boat was sometimes used, and, occasionally,

other means resorted to as convenience or necessity directed, equivalent to the hire of a wagon and one horse and driver for the whole time, at \$2 50 per day.

Note.—Other chain carriers and axemen were occasionally hired for a few days, while exploring the routes to Newtown, Oxford, Aspys, Tullytown, &c.

(B.)

The location of 18 miles of canal from Bristol upwards, was commenced on the 13th of September last, extending to near Taylor's ferry. The persons employed thereon, are as follows, viz.

Thomas G. Kennedy, superintendent, \$3 per day.

Henry G. Sargent, engineer,

Emerson M'Ilvaine,

Charles G. Schlatter,

Thomas Stewart, jr.

Michael S. Hoaney,

David Kirgan, axeman, at \$1 per day.

Chain carriers and another axeman are occasionally employed when wanted for a short time, at \$1 per day.

C.

The survey from Carpenter's Point to Easton, was commenced on the 17th of September last, and is now in progress; the party consist of

Henry G. Sargent, Engineer.

William Willer, } Assistant do. \$ 60 per month.

James Sargent, } \$ 60 per month.

Charles Miller, Surveyor and draftsman, \$ 60 per month.

Charles Heckman. } Target-bearers, \$ 1 50 per day.

Charles Carey, } \$ 1 50 per day.

William Nyce. } Employed as Target-bearers, during the sick-

John Hornbock, } ness of Heckman and Cary, \$ 1 50 per day.

William Cowell, } Chain carriers, \$ 1 per day.

John Smith } \$ 1 per day.

Ralph Harris. Axeman. \$ 1 per day.

Stephen Docice. Cook, \$ 1 per day.

Transportation of baggage, same as from Easton to Philadelphia.

Note.—This party suffers much from sickness, which makes the occasional employment of supernumeraries indispensable. They are, however, in no instance, retained longer than absolutely necessary.

(D.)

CONTRACTORS.	Sections of half a mile each.	Grubbing and clearing the whole section.	PER CUBIC YARD.						PERCH.		SQUARE YARD.
			Excavation.	Embank- ment.	Pud- dling.	Solid rock.	Slate rock.	Hard pan.	Vertical wall.	Outer slope wall.	
John L. Bevins Morris, Cook, & Co. Jedediah Beckwith Do	No. 1	25	7 $\frac{3}{4}$	9 $\frac{1}{2}$	-	50	35	25	60	50	25
	2	25	8	8	25	75	60	25	60	50	25
	3	-	8	12 $\frac{1}{2}$	25	75	60	25	60	50	25
	4	-	8	12 $\frac{1}{2}$	25	75	60	25	60	50	25
	5	-	7 $\frac{1}{2}$	12 $\frac{1}{2}$	-	50	60	25	60	50	25
Daniel Thomas John L. Bevins Daniel Thomas Morris, Cook, & Co. Do	6	-	7 $\frac{1}{2}$	11	-	50	35	25	60	50	25
	7	25	7 $\frac{1}{2}$	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	8	-	7 $\frac{1}{2}$	7	-	50	35	25	60	50	25
	9	15	7	7	-	50	35	25	60	50	25
	10	15	7	7	-	50	35	25	60	50	25
Daniel Thomas Phineas Paxon Kasson, Gray, & Co. Th. & James R. Scott Do	11	-	7 $\frac{1}{2}$	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	12	-	7 $\frac{1}{2}$	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	13	10	9	16	-	50	35	25	60	50	25
	14	-	7 $\frac{1}{2}$	12	-	50	35	25	60	50	25
	15	-	7 $\frac{1}{2}$	12	-	50	35	25	60	50	25
Benjamin R. Morgan Do Do Morris, Cook, & Co. Kasson, Gray, & Co.	16	-	7	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	17	-	7	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	18	-	7	12 $\frac{1}{2}$	-	50	35	25	60	50	25
	19	2 50	12	12	-	59	35	25	60	50	25
	20	25	11	16	16	60	35	25	60	50	25

D—Continued.

CONTRACTORS.	Sections of half a mile each.	Grubbing and clearing the whole section.	PER CUBIC YARD.						PERCH.		SQUARE YARD.
			Excavation.	Embankment.	Puddling.	Solid rock.	Slate rock.	Hard pan.	Vertical wall.	Outer slope wall.	
Christopher Medler -	21	-	9½	11	25	60	25	16			
Morris, Cook, & Co.	22	50	9	9	-	50	35	25			
Christopher Medler -	23	-	9	11	25	60	25	16			
Blackstock & Moor -	24	-	7	12½	12	37½	-	18			
Morris, Cook, & Co. -	25	1 50	10	10	-	50	35	25			
Blackstock & Moor -	26	1 50	8½	12½	12	37½	-	18½			
Morris, Cook, & Co.	27	25	9	9	-	50	35	25			
Do	28	-	9	9	-	50	35	25			
Do	29	-	8	8	-	50	35	25			
Do	30	60	10	10	-	50	35	25			
Do	31	2 00	10	10	-	50	35	25			
Barker, Smith, & Mc-											
Allister -	32	-	8½	11	-	42	24	18½			
Do	33	-	8½	11	-	42	24	18½			
Do	34	-	8½	11	-	42	24	18½			
Patrick Mulvaney -	35	1 55	8	14	-	45	18	18		40	25
Do	36	1 55	8	14	-	45	18	18	-	40	25
Average excavation -	-	-	8								
Average Embankment	-	-	-	11½							

NOTE. Blanks in the foregoing statement to be filled at the estimate of the Engineer.

(E.)

Sections of 1 mile each, beginning at Bristol.	Section as numbered on estimate.	Grubbing and clearing the whole sect.	PER CUBIC YARD.		
			Excavation.	Embankment.	Solid rock.
	No.	Dolls.	Cents.	Cents.	Cents.
1st mile section	60	-	8	11	
2d do	59	-	7		
3d do	58	-	7		
4th do	57	-	7		
5th do	56	-	8		
6th do	55	-	8	11	
7th do	54	-	8		
8th do	53	-	8		
9th do	52	200	8		
10th do	51	-	10		
11th do	50	-	15		
12th do	49	-	10	-	50 { bluff point at Morrisville.
13th do	48	300	12	12	
14th do	47	200	11	11	
15th do	46	-	8		
16th do	45	200	8		
17th do	44	350	9½		
18th do	43	-	8		

From the foregoing statements it will be seen,

that the average price for common excavation,

according to the estimate, is $8\frac{11}{12}$ cts. pr. cub. yd.

And according to the the actual letting it is $8\frac{12}{35}$ do

For embankment, per estimate $11\frac{1}{2}$ do

do per contract $11\frac{11}{35}$ do

And this average will, in reality, be reduced somewhat lower; because, on some of the sections where the highest prices are proposed for embankment, there will be none, as on 13 and 20; and on others very little, as on 35 and 36.

The actual letting is, therefore, less than the estimate, for it will be recollected that Mr. Sargent's estimate, from which the foregoing is copied, was predicated on the supposition that the canal would be four feet deep; and to which estimate the sum of \$45,972 30 was afterwards added for a five feet cut; being about 16 cents per cubic yard for the excavation of the additional foot. This sum, should no unforeseen difficulties present themselves, it is fair to conclude, will be excess in the estimate.

No comparative view of the other items of the contract prices can be made with any approximation to accuracy: for, although proposals were offered and received on many of the sections, as well for

rock, hard-pan, &c. as for common excavation and embankment, yet it is not anticipated that much will occur on the 18 miles. except some solid and detached rock, in the neighborhood of Morrisville, especially on the 19th. 20th, and 21st sections. and some shell or slate rock on three or four of the upper sections. Nor can any comparison between the estimated and actual cost of locks, aqueducts, culverts, or bridges, be made, as none have yet been put under contract.

To the Board of Canal Commissioners of Pennsylvania.

GENTLEMEN : In compliance with instructions received from the Secretary of the Board at Philadelphia, on the 8th of July last, relative to a survey for a canal along the valley of the Delaware river. I proceeded immediately to Easton : and, as soon as a sufficient party could be organized, the necessary surveys and examinations were commenced, keeping in view a continuation of the canal up the Delaware to Carpenter's Point. My attention has been directed to an examination and estimate of the route South of the Lehigh. In commencing this survey, it was important to determine the most eligible mode of crossing the Lehigh, and of making use of that stream as a feeder.

To effect these two objects, I adopted the plan of raising the water in the Lehigh ten feet. by a dam of corresponding height. and, accordingly, assumed a level ten feet above the surface of the water, at its junction with the Delaware, for the governance of my examinations. From this point, a careful and particular estimate of each mile has been made, including fencing, bridges, aqueducts, culverts, rebuilding roads. &c. The aggregate expense of each mile so estimated, together with the amount for lockage, waste weirs. and the dam across the Lehigh, also comparative estimates of the Bristol and Tullytown routes. and the additional expense for a canal of five feet depth, will be seen by a reference to the schedule of estimates hereunto annexed.

In constructing this canal the most important difficulty is in passing bluff rocky hills, which, in many places. form the shore of the river, making it necessary to raise embankments from the water's edge, which must be protected by a wall, varying in height from fifteen to twenty feet, according to the relative situation of the river banks. A large portion of the route passes over undulating bottom land, soil generally sand, loam, and gravel.

After passing New Hope about four miles, the country west of the river becomes more level ; bottom land increases in width, and the general aspect would seem to give more latitude to the location of a canal. Under this impression various routes were suggested for the purpose of crossing the country to Neshamony, and actual surveys have been made on the most favorable that could be found. The result of these examinations, I think determines the impracticability of either of the routes suggested : consequently the location of the canal must be confined immediately to the valley of the Delaware, as

far as Morrisville. At this place a question arises as to the most favorable place of termination. To this effect, different routes have been examined, the most prominent of which are those designated in the schedule of estimates by the names of the Bristol and Tullytown routes. A view of the relative situation of these routes may be seen by a reference to the map herewith presented.

This it is presumed, will be sufficient for the governance of the Board in fixing on the place of termination.

The estimates hereto annexed are predicated on the supposition that the canal be 40 feet wide at the top, 28 at bottom, and 4 feet depth. Locks 90 feet clear in length, and 14 feet width.

The additional estimate for 5 feet depth, supposes the canal to be 40 feet wide at top, with proportionate width at bottom. Locks 100 feet clear in length and 14 feet width.

All which is respectfully submitted,

H. G. SARGENT. *Engineer.*

Bristol, August 20, 1827.

Estimate of the cost per mile of the canal along the valley of the Delaware, commencing on the south side of the Lehigh at Easton.

No. of miles.	Cost per mile.	No. of miles.	Cost per mile.
1	\$20,436 22	29	\$10,555 79
2	19,732 30	30	28,076 25
	12,448 00	31	4,679 20
4	18,873 12	32	4,849 39
5	17,823 24	33	6,185 20
6	12,757 60	34	3,687 20
7	27,335 90	35	10,220 24
8	29,178 00	36	7,534 00
9	3,302 80	37	5,023 00
10	12,390 48	38	4,838 64
11	11,135 68	39	11,684 40
12	12,256 28	40	4,135 60
13	23,202 00	41	6,708 00
14	4,619 20	42	8,003 00
15	5,103 16	43	3,674 00
16	4,342 80	44	5,566 00
17	4,501 84	45	5,013 20
18	3,643 20	46	4,672 80
19	3,397 49	47	4,939 20
20	2,566 51	48	9,220 80
21	3,299 11	49	5,833 00
22	9,086 72	50	2,884 40
23	9,303 10	51	4,578 00
24	4,332 40	52	4,076 40
25	12,863 40	53	4,535 44
26	4,307 40	54	4,446 64
27	12,946 27	55	4,206 40
28	32,585 88	56	9,193 96

\$ 526,740 05

Waste weirs,	\$ 3,000 00
Dam across Lehigh,	6,000 00
Lockage 170 feet at \$200 per foot,	34,000 00

509,740 25

Add 10 per cent for contingencies,	56,974 02
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Total amount of the Tullytown route,	626,714 27
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Average per mile at 4 feet cutting,	11,191 32
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Estimate of the Tullytown route for a canal 5 feet deep.

To	626,714 27
Add	43,184 46

Total amount	\$669,698 73
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Average per mile,	11,962 47
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Estimate of the Bristol route, continuing from the end of the section fifty-one, on the Tullytown route.

	No. of miles.	Cost per mile.
Amount to and including	51	\$ 500,281 11
	52	4,476 40
	53	4,935 44
	54	4,846 64
	55	6,178 00
	56	4,618 00
	57	2,928 00
	58	3,058 00
	59	2,970 00
	60	5,094 00

539,385 89

Add for waste weirs, dam locks, as for the Tullytown route	43,000
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582,385 89

Add 10 per cent. for contingencies, &c.	58,238 58
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\$ 640,624 47

Average per mile at 4 feet cutting	\$ 10,677 07
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Estimate of the Bristol route for a canal of five feet deep.

To	\$ 640 624 47
Add	45.972 30
Total amount	686.596 77
Average per mile	11,443 27

To the Board of Canal Commissioners of Pennsylvania.

GENTLEMEN : In pursuance of instructions received from the Secretary of the Board, I have continued a survey and estimate for a canal along the valley of the Delaware river, from Bristol to Philadelphia, terminating at Kensington, near Mr. Dyott's glass factory.

The level for this line was commenced at a benched willow tree, opposite the borough of Bristol, corresponding with the anticipated location of the canal at that place, as previously surveyed, and extended along the north side of the turnpike to Neshamony creek. From thence, crossing the turnpike, the line passes between it and the river, to the place of termination.

The surface of the country generally, is considerably undulating, which would cause frequent extra excavations and embankments. The soil is principally loam, sand, and gravel, some cobble stone.

In making the estimate I have calculated the cubic yards of excavation and embankment, at prices varying according to the nature of the work. The estimate for aqueducts over Poquiston, Pennypack and Frankfort creeks, supposes them to be built with stone abutments and piers, with wooden superstructures. The one over Neshamony is calculated to be built entirely of stone ; whole length of water-way two hundred and sixty feet.

Fences and bridges, and all other necessary appendages have been included in each mile, the aggregate of which will be seen by reference to the schedule of estimates hereto annexed.

All of which is respectfully submitted.

H. G. SARGENT, *Engineer.*

Philadelphia, Sept. 10, 1827.

Estimated expense of a canal from Bristol to Philadelphia.

Section No. 1	\$4,498 40	
2	4.952 80	
3	50,322 00	Including aqueduct over Neshamony creek.
4	4,214 00	
5	5.480 00	
6	5,412 77	
7	4,912 00	
8	10,801 60	do. Poquiston.
20		

Section No. 9	4,987 84	
10	5,302 00	
11	19,959 92	Including aqueduct over Pennypack.
12	5,736 84	
13	7,468 08	
14	18,857 90	do. Tocony or Frankford.
15	4,506 40	
16	4,336 40	
17	4,417 60	
17½ miles 18	7,944 64	Basin at Kensington.
<hr/>		
	\$174,111 19	
Add 10 per cent	17,411 11	
do. 5 feet canal	9,276 80	
<hr/>		
	200,799 10	
<hr/>		
	\$11,474 23 $\frac{43}{100}$	Expense per mile for 5 feet canal.

Estimate of the cost of the eighteen miles of the Delaware Division now under contract, at contract prices.

The excavation and embankment the whole distance, including bridge, embankments, rock and grubbing	71,922
For fences, bridges, aqueducts, culverts, &c. which have not yet been contracted for, the original estimate was	25,199
	<hr/>
Whole cost of the 18 miles,	\$ 97,125
	<hr/>

H. G. SARGENT, *Engineer.*

December 15, 1827.

Statement showing the probable cost of the several divisions of the Pennsylvania canal, according to contract rates, the amount at which they were estimated, naming the engineer who made the estimate, and explaining the cause of differences.

1. *Eastern Division.*

Original estimate of Wm. Strickland	\$405,511
Estimate of the cost of increasing the size from Peter's mountain to Harrisburg	59,700
	<hr/>
	\$ 445,211
	<hr/>
	445,211

Amount of work done on the line to December, 1827	335,894	
Amount necessary to complete	126,362	
	<hr/> 462,256	
		<hr/> 462,256
Excess of cost above estimated	-	\$17,015
The following works were not included in the original estimate, viz. twenty-two bridges	11,000	
Upper lock, not originally necessary, but made so by alterations at the upper end	8,800	
Fencing	5,750	
	<hr/> 25,550	
		<hr/> 25,550
Real cost below estimate		\$8,505

2. *Western Division.*

1st Part. From Kiskiminetas to Pine creek

Amount of whole cost	\$396,220
Estimate of N. S. Roberts	297,748
	<hr/>
Excess of cost above estimate	\$ 98,477

This difference is accounted for by the occurrence of hill slips and other unforeseen circumstances, explained in the report of the acting Commissioner and Engineer.

2d Part. From Pine creek to the Monongahela.

A variety of estimates have been made for this distance, upon many different routes, none of which correspond precisely with that adopted, so that an accurate comparison cannot be made. It is stated generally that the contracts on this section, and its final cost, will fall below what was expected.

3. *Kiskiminetas Division.*

By the adoption of locks and dams on this division, a saving of about 90,000 dollars has been effected on that part which was estimated by Mr. Olmstead. The lower 12 miles were never estimated by any engineer, until put under contract.

4. *French Creek Feeder.*

Cost of contract prices	80,758
Estimate of Major Douglas, 1826	79,697
	<hr/>
Difference	\$1,051

5. *Susquehanna Division.*

Estimate of Judge Geddes, 1826	\$348,567	
of Mr. Guilford at contract prices	441,350	
	<hr/>	
Difference	92,783	
This difference is easily explained. The calculations of Judge Geddes were made for wooden locks, at \$1 50 per foot : those of Mr. Guilford are of wood and stone combined, and the difference in the cost of locks is	42,000	\$92,783
The cost of replacing a road, not estimated by Judge Geddes, is	20,596	
The dam at Shamokin ripples was omitted by Judge Geddes, as being likely to produce more than its cost	27,000	
The additional bridges not estimated by Mr. Geddes are	10,000	
	<hr/>	
	99,596	
	<hr/>	
		99,596
		<hr/>
Difference in favor of Mr. Guilford		\$6 813
		<hr/>

6. *Juniata Division.*

For a statement on this subject, see the report of James Clarke, Esq. Superintendent, and the comparative statement therein referred to.

7. *Delaware Division.*

The part now under contract was estimated by Henry G. Sargent, engineer, at	\$74,801
It will cost at contract prices	71,922
	<hr/>
Difference	\$2 879
	<hr/>

AN ACT OF THE STATE OF VIRGINIA.

An act giving the assent of this State to an act further to amend the act incorporating the Chesapeake and Ohio Canal Company, passed by the State of Maryland. (Passed Feb. 26, 1828.)

Whereas it is represented that the General Assembly of the Commonwealth of Maryland hath passed at their present session. an act, entitled "An act further to amend the act incorporating the Chesapeake and Ohio Canal Company," in the words following, to wit :

“Whereas it is represented to this General Assembly, that it may tend greatly to the promotion of the object of the original act incorporating the Chesapeake and Ohio Canal Company, to authorize a subscription for its stock by aliens; and doubts have arisen, whether, under said act, such stock may be held by others than citizens of the United States; and whether the stock of said Company, is to be regarded as real or personal property:

1. *Be it enacted by the General Assembly of Maryland,* That it shall and may be lawful for the Commissioners for the time being, and for the President and Directors of said Company, whensoever the same shall be duly organized, agreeably to the provisions of the original act aforesaid, to receive subscriptions for any number of shares of the capital stock of said Company, from any alien or aliens, who are hereby declared competent to hold the same; and, if in their judgment it be necessary, to appoint an agent or agents to visit Europe for that purpose.

2. *And be it enacted,* That the shares of the capital stock of the said Chesapeake and Ohio Canal Company, shall be deemed and taken to be personal estate, and as such to be liable to be assigned and transferred: *Provided,* That it shall not be lawful for any stockholder in said company to assign any share or shares, by him or her held, unless it be in person, or by attorney, upon the books of said company: *And provided, also,* That no transfer or assignment shall be made, except for one or more whole share or shares, and not for any part of such share or shares; and that no share or shares shall at any time be assigned or transferred, or held in trust for the use and benefit, or in the name of another, whereby the said President and Directors, or stockholders, of the said company, or any of them, shall or may be challenged or made to answer concerning any such trust; but that every person appearing as aforesaid to be stockholders, shall, as to others of the said company, be, to every intent, taken absolutely as such; but as between any trustee, and the person for whose benefit any trust shall be created, the common remedy may be pursued.

3. *And be it enacted,* That the words ‘nor any payment demanded within any year from the commencement of the work,’ inserted in the proviso to the fifth section of the original act incorporating the Chesapeake and Ohio Canal Company, passed the twenty-seventh day of January, eighteen hundred and twenty-four, by the General Assembly of Virginia, and subsequently confirmed by the General Assembly of Maryland, be, and the same are hereby repealed and expunged from the aforesaid proviso; and henceforth the said proviso shall be construed in the same manner, and have the same effect, as if the aforesaid words had never been inserted therein.

4. *And be it enacted,* That this act shall commence and be in force as soon as it shall have received the assent of the Legislature of Virginia, of the Congress of the United States, of the Potomac Company, and of the stockholders of the said Chesapeake and Ohio

Canal Company, to be given at their first general meeting after the passage of this act."

1. *Be it therefore enacted by the General Assembly of this Commonwealth,* That the assent of this Legislature in and to the amendments to the "Act incorporating the Chesapeake and Ohio Canal Company," as contained in the foregoing act of the General Assembly of Maryland, is hereby as fully and completely given, as if the said amendatory act had been passed by this present General Assembly.
2. This act shall be in force from the passing thereof.













